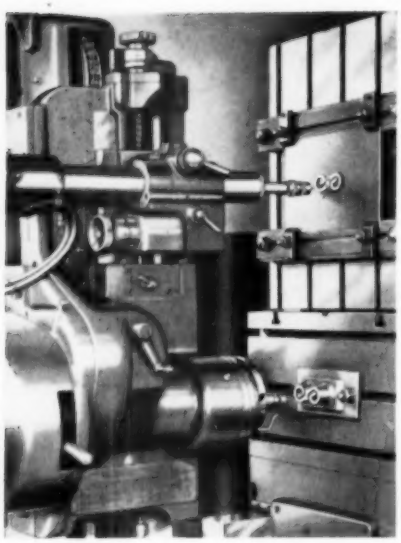
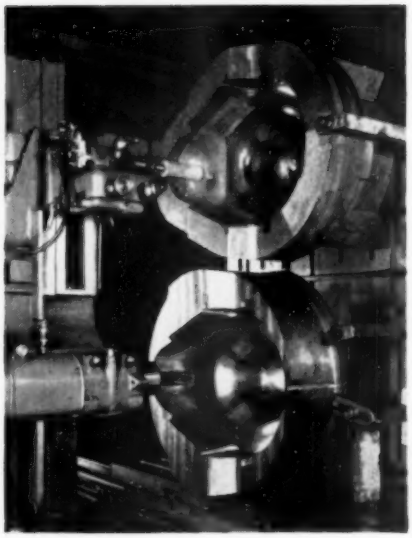
THE TOOL ENGINEER

OFFICIAL PUBLICATION OF THE ASTE AMERICAN SOCIETY OF TOOL ENGINEERS

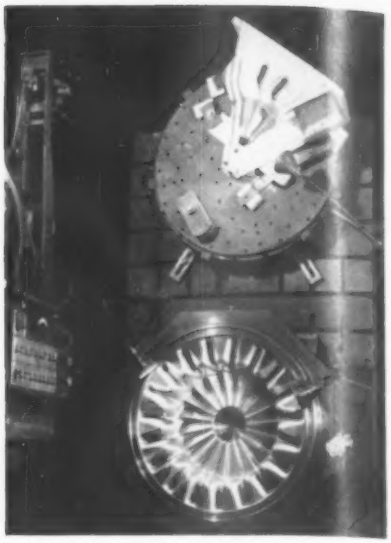
Behind every manufactured product is the tool engineer



Profiling the punch for blanking a tiny manganese bronze flat spring from a sheet metal template. Punch, die and stripper were milled on the same machine. This is typical of two-dimensional Kellering, jobs ranging upwards from this small one.

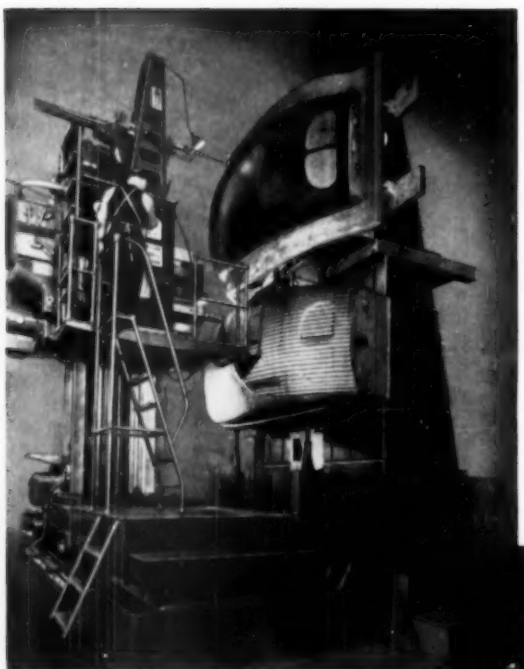


This will be a permanent mold for the precision casting of aluminum power-lawnmower housings. The three-dimensional master shown here is made of wood; Kellering can also be done with masters of plaster, or any other easily worked material.



This would be difficult and complex without a Keller—milling a forging die for a jet engine impeller. Tracer-controlled milling faithfully reproduces the three-dimensional partial model in each successive index position, to produce a perfect completed die.

Has everybody here seen Keller?



The largest of the Kellers, Type BG-3, is finish-cutting (after roughing out) a huge die for an automobile roof panel, tracing a master cast made from the final approved mock-up. It required Kellering to make large dies like this possible and practical. Without Kellering, modern streamlined cars would not exist.

Picture a machine with an extremely delicate sense of touch . . . one that can trace every contour of an intricate model or master — and deftly translate it into tough metal — automatically, accurately, economically.

That's Keller at work. Versatile, dependable, productive — it can save you time and money regardless of the complexity of your die or mold making problems, in both machining and finishing stages.

Tracer-controlled milling or "Kellering" is the accepted modern method of creating dies and molds rapidly at least cost. One or more of the seven sizes of Keller machines (which can be arranged to give 14 work capacities) will meet your needs, whether they be for die-casting dies, forging dies, or plastic molds. Write for literature. Pratt & Whitney, *Div.* Niles-Bement-Pond Company, West Hartford 1, Conn.

Pratt & Whitney
Keller Machines

The Tool Engineer

Official Publication: American Society of Tool Engineers

July, 1948

Vol. XXI, No. 1

Firecrackers and Free Enterprise

WHEN THE MONTH of July comes, our attention is focused on things patriotic. On the fourth day we celebrate the signing of the Declaration of Independence. The nation's orators are out full force, tuned to top volume. They point with pride and view with alarm. Drums beat. Flags wave in the breeze. We glory in America's progress, her cultural attainments and industrial strength.

If we let our thoughts wander beyond the superficialities of the observance, we come to consideration of the assets which made America great. We might sum them up and say "our freedoms". And one of the most important of these is bound to be our system of free enterprise which guarantees to every man the right to work, to earn, to enjoy the things his earnings will buy, and to improve his station in life by working harder and better to increase his purchasing power.

Another thing synonymous with July 4 is firecrackers. Thoughts of firecrackers paint gay pictures of fun and excitement, of fathers and children playing together. But, always in the background there lurks an element of danger.

Putting the two trains of thought together, we come to consider the firecrackers hidden among the benefits of free enterprise.

American free enterprise has created a world filled with pleasant and exciting material advantages . . . a wealth of goods and gadgets with which to play. Taken for granted, or considered casually, these conveniences and comforts can take on some of the dangers of firecrackers. They too can explode in our hands and be left blackened and twisted. Singed fingers won't be the result, as when a penny firecracker is not treated with proper respect. This explosion would leave scars upon the whole economic and political world so deep it would require centuries to erase them.

The firecracker in the benefits of free enterprise lies in renunciation by many Americans of one of the rights it guarantees —the right to work. Mechanization of industry and mass production has made possible an amazing flow of goods at the same time work-time was decreasing and pay checks increasing. Many workers have come to feel that this can go on forever. They grow continuously more jealous of their share of the goods, but at the same time are willing to work fewer and fewer hours each week in return.

There is a tendency to forget that hard work and ingenuity made possible the work-saving machines, and that only hard and constant work will continue to improve them. Certain workers, seeing their share of the goods fail to grow in keeping with their desires, or threaten to diminish, try to perpetuate the flow, or increase their share, by turning to a paternalistic government for protection. They clamor for heavier subsidies on more commodities, for softer unemployment cushions, for socialization of essential services. These they would substitute for work, never realizing that effort and skill are the only things upon which they can reasonably expect a return.

It is ironical to think that among the celebrants of the birth of our nation, whose founders felt that the right of every man to work and prosper accordingly was something worth the struggle and fight to make prevail, are many people who would rather depend on someone else than upon their own resources to fulfill their desires.

That is the firecracker in free enterprise . . . the numbers who enjoy its benefits so thoughtlessly that they are willing to renounce its precious guarantees of freedom in an attempt to stretch these benefits beyond the limits of their elasticity. In order to avoid work, they would sacrifice their freedom and light a firecracker that would destroy the whole system.

I. F. Holland

President 1948-49

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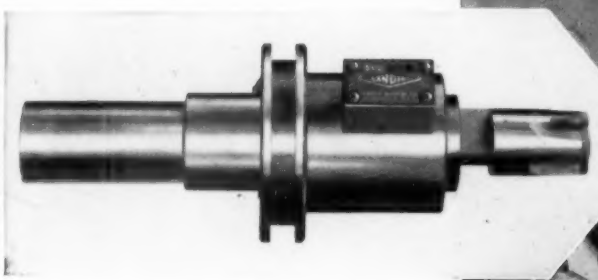
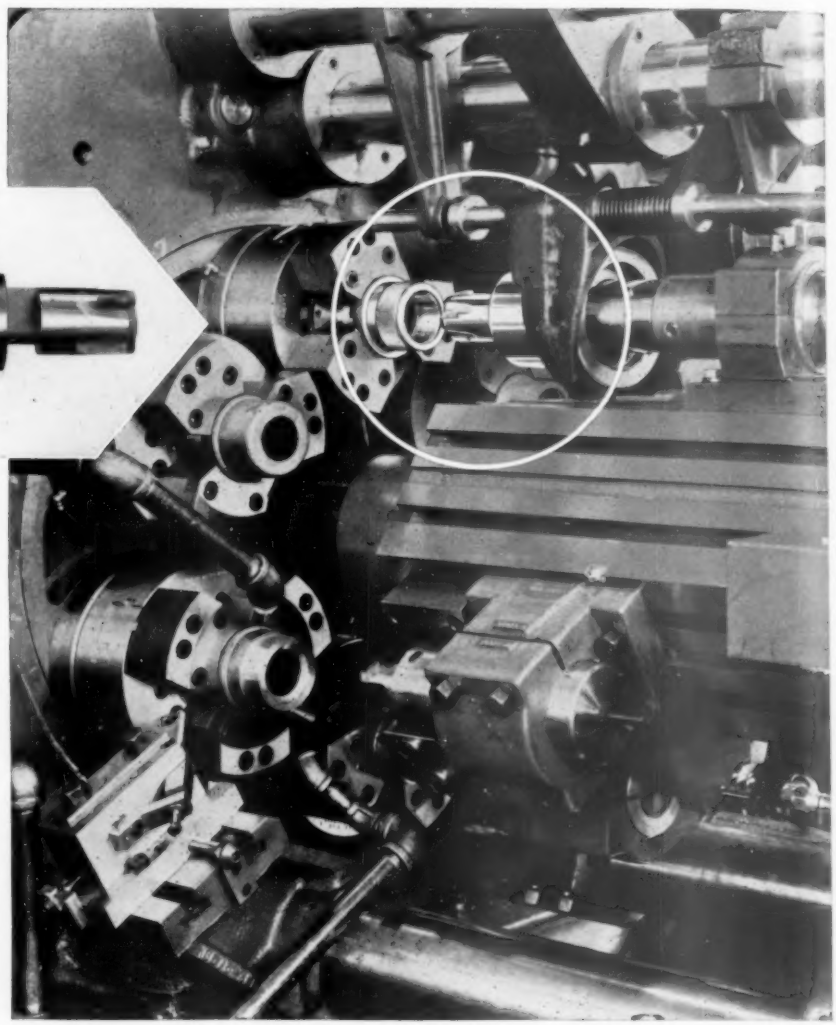
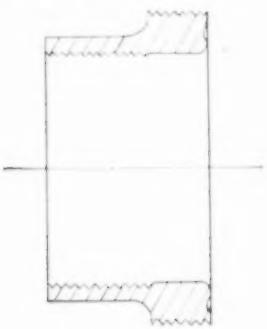




• CUTS INTERNAL TAPERED THREADS AT 30 FEET PER MINUTE.



Using the new Landis Style LL Receding Chaser Collapsible Tap on an automatic screw machine, 2" 11½ pitch tapered pipe threads 1-5/16" long are tapped in quick change unions for oil field use at the rate of 30 feet per minute. The unions are cold worked forging 2⅜" in diameter of 185-220 Brinell hardness. The same piece is also made of malleable iron, and tapered threads are tapped at the rate of 120 feet per minute.

The LL Taps are designed primarily for tapping tapered threads to A.P.I. standards. An outstanding feature is the detachable tap head permitting the use of various size tap heads to cover a wide range of thread sizes with a minimum amount of equipment.

In the improved Style ALM Heads, where an even number of chasers is used, no two chasers are directly opposite each other. This adds greater rigidity for the tap and permits the use of greater radial clearance, giving a freer cutting action with resulting increased chaser life. The Style LL Tap Body is made in four sizes to cover a range of nominal pipe sizes from 1" to 12", inclusive.

Write for Bulletin G-95

LANDIS MACHINE CO.
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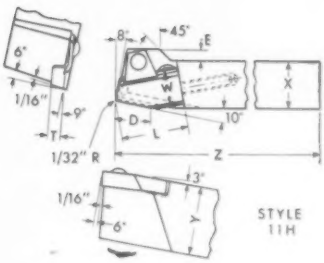
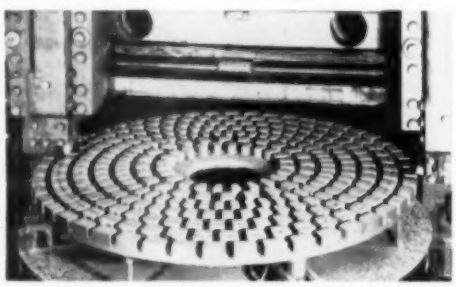
IF Interrupted Cuts Are Your Problem

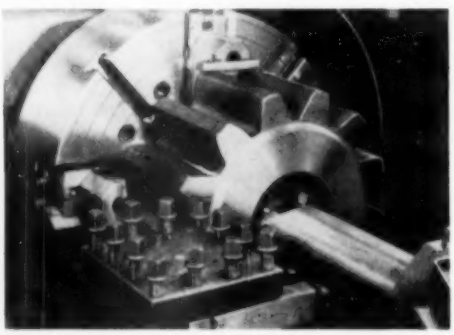
Learn About Kennametal



Style 11H is one of a complete line of Kennametal tools, having sturdy, clamped-in, advanceable Kennametal tips. This assembly—developed by Kennametal—is highly successful on interrupted cutting, and is equally outstanding on continuous-cut operations. It utilizes Kennametal's high strength to best advantage—provides a thermally-strain-free assembly; makes possible deep cuts and heavy feeds; simplifies grinding since tip is advanced and re-sharpened without removing any steel from shank; and enables practically all of the Kennametal tip to be utilized for cutting.



This iron casting has 288 chilled lump interruptions. A Kennametal standard Style 11T80 tool faces and turns it at 190 ft./min., .048" feed, and ¼" depth of cut.



Kennametal bores, turns, and faces over interruptions and sand holes on this chrome-nickel steel rack pinion. Speed—155 ft./min.; feed—.032"; depth of cut—¼" to 5/16". Performance is 5 to 1 over high speed steel tools in production and pieces per grind.

You're probably enjoying the advantages of carbide tooling on continuous-cut operations—but how about interrupted cutting?

Has this given you tool trouble, and made you resort to slower machining methods on some important jobs?

If so, Kennametal will help you solve this problem. Its ability to withstand the shock of interrupted cuts, on both cast iron and steel, has been unequalled.*

Although cutting conditions are often improved by changing the tool shape so that the shock will be imposed on a section of the tip that is stronger and better supported, it is still the carbide that must take the punishment. Here's where Kennametal has a distinct advantage.

Because of exclusive processing methods and careful control in manufacture Kennametal's impact strength is unusually high for such a hard material—as great as that of hardened alloy steels having much lower hardness and compressive strength.

Still further advantages for interrupted cutting are obtained by the use of mechanically-held tools developed by Kennametal Inc. Tips of characteristically high impact strength are securely clamped to, and firmly supported by a heat-treated steel shank, to provide an exceptionally strong strain-free assembly.

If you have had difficulty with carbide tools on interrupted cuts, let us engineer Kennametal to the solution of your particular problem.

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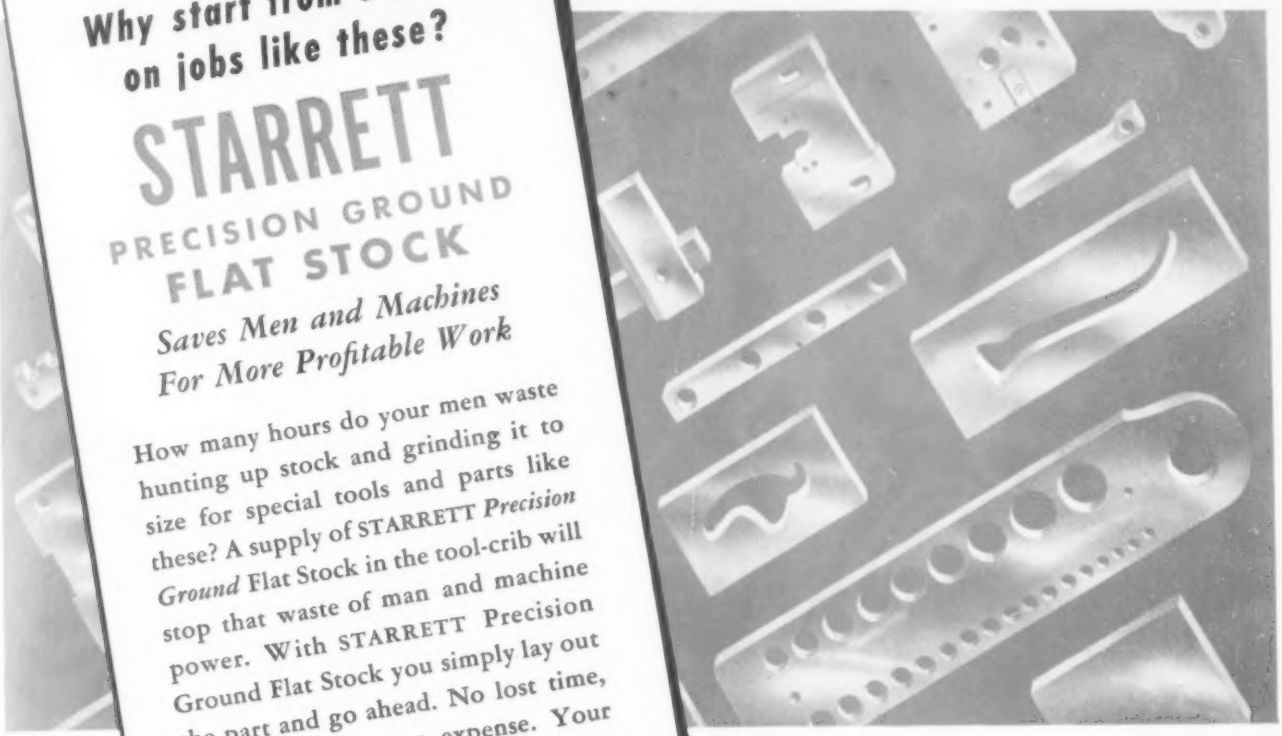

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These Morse drills of high speed steel have been given the MT 14-5 treatment. After the Morse standard redraw, MT 14-5 is the "something that's been added" to harden the drill surface to withstand abrasion while adding a lubricant value to reduce the coefficient of friction. This added heat treatment results in a tool with cutting edges that last longer and a tool with reduced marginal wear.

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3. **Drilling with reduced coefficient of friction**

Morse, with one of the most complete heat treating plants in the country, can give the high speed steel drills you need for special drilling jobs MORE than standard heat treatment. If you're up against a high degree of abrasive action; tough stringy metals — or adhesive materials, *MT 14-5* is the magic phrase!

Here's why: In addition to the redraw of its high speed tools which is standard with Morse and reduces brittleness while toughening the metal to withstand an amazing amount of strain and shock — MT 14-5 is an *extra* combination heat treatment which hardens the drill surface to withstand excessive abrasion while adding a lubricant value that reduces the coefficient of friction. Result: *a drill with reduced marginal wear and its cutting edges maintained longer.*

The MT 14-5 is another example of Morse's versatility and skill in meeting special drilling problems. If you, too, have a similar or special drilling problem, ask your Industrial Supply Distributor for the proper Morse heat treatment and tool recommendation to meet your needs.

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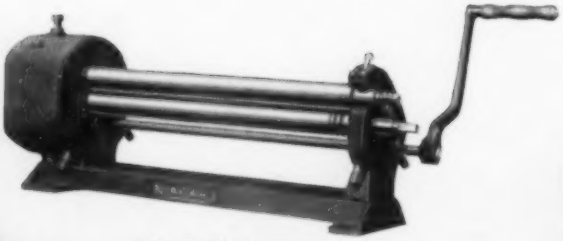
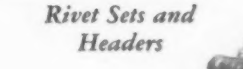


Slip Roll Former

Hand Groovers



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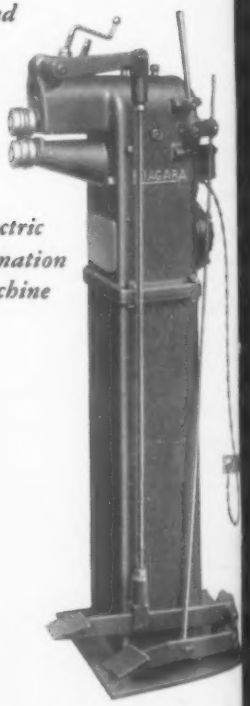
Crimper and Beader



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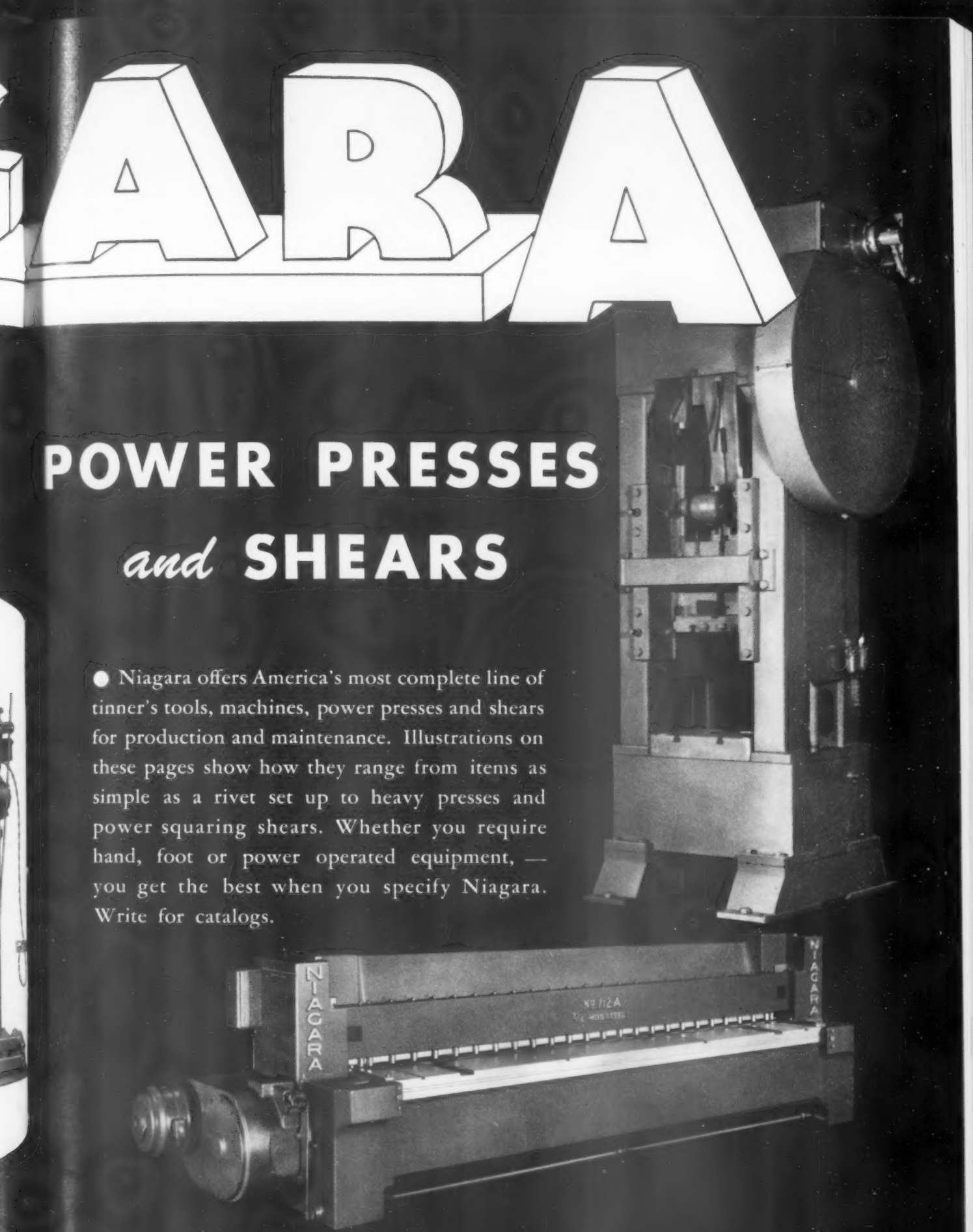

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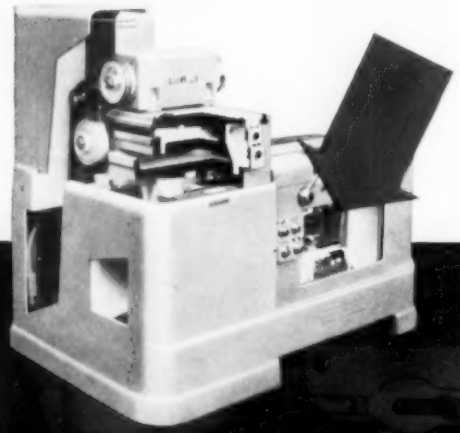

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In every model of Heald's complete line of new Bore-Matics, you'll find *many* advanced design features that mean faster production, greater precision, and better finish—with easier operation, quicker setups, and less maintenance. In addition to the latest advances in *hydraulics,* Heald offers you such outstanding features as: rigid box-type bases—ventilated bridges — permanently lubricated boringheads — roll out power units — and many more. *All,* features that make the new Heald Bore-Matics today's best buy in precision finishing.

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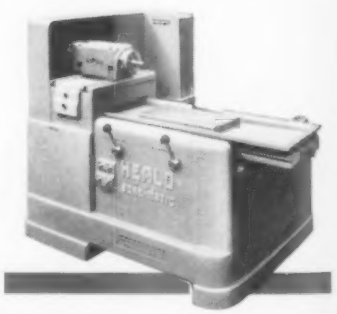
6. Flared Steel Piping — provides tight, leak-proof joints, submerged in oil reservoir to prevent possibility of air bubbles.



Heald Bore-Matics are available in a complete range of sizes to meet all operating requirements — in single-end machines, like the Model 321 shown above, or in double-end models. Send for descriptive literature, or better still, let your nearest Heald representative show you how the new Bore-Matics can do a better job at less cost on your work.

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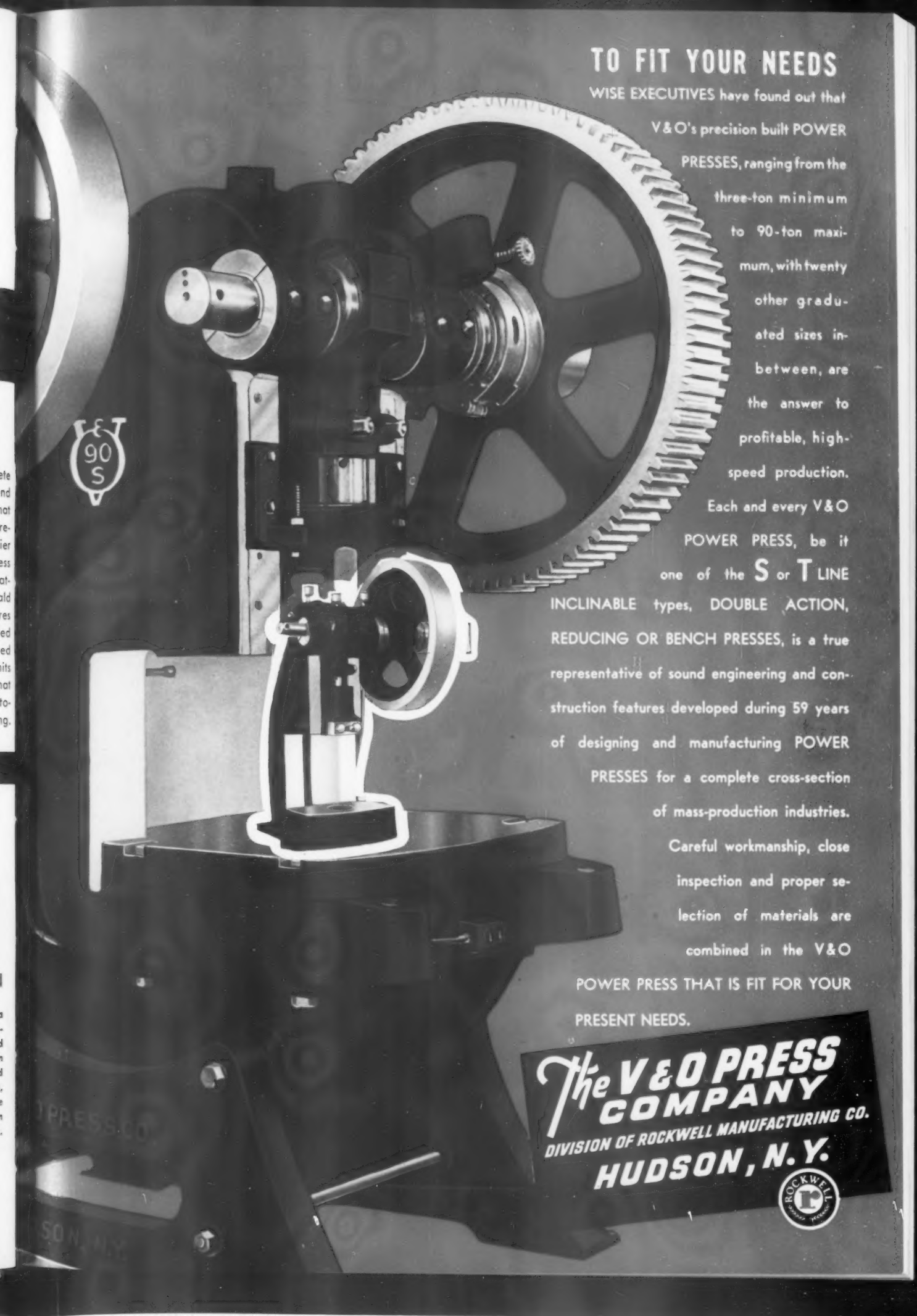

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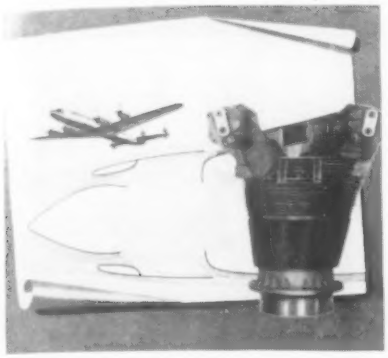


Tooling the Wright Cyclone Forged Cylinder Head

By F. E. Whitacre

The problems of machining a new alloy solved by advanced tool engineering

BECAUSE OF CONSTANTLY rising power requirements for aircraft engines, which must be kept at a minimum of size and weight, the Wright Aero Corporation has turned to the use of forged aluminum cylinder heads. In discussing the processing involved in their manufacture, however, it is necessary that the development and engineering background upon which a forged and fully machined cylinder head is based, and by which it is justified, is fully understood.

To date, there have been two major types of cylinder heads—cast and machined, and forged and machined. The first type requires both extensive foundry and machine facilities, while the second requires no foundry facilities but some additional machining facilities. It also offers some added advantages, among which are the following:

Greater physical strength, approximately 90%. The material in the final head after heat treat will test approximately 40,000# per square inch in an ultimate tensile test; has better heat conductivity due to a more uniform and denser material; better control of the density and uniformity of the material; better control of the outside shape of the finished product—particularly advantageous since sheet metal baffles must be fitted around the cylinder; and considerably reduced scrap after the original forging operation as compared with the casting operation.

F. E. Whitacre **is Manufacturing Engineer for the Wright Aeronautical Corporation, the engine producing plant of Curtiss-Wright Corporation. A graduate M. E. from Carnegie Inst. of Technology, he served as Assembly Liaison Engineer during World War II; then, at the conclusion of the war, was in charge of Machine Shop Liaison Section, Production Engineering Department, prior to assuming his present position.**

Furthermore, machining of fins permits deeper finning than casting, which in turn offers better cooling; there is greater cooling effectiveness, permitting more power to be taken from each cylinder and also reducing cooling drag approximately 50%—making available approximately 100 HP additional. The forged head permits an increased power output per cylinder, with resultant increased power output per engine with decrease in total pounds per HP output; therefore, the final gain is more pounds of payload per pound of engine. And this is the goal which fosters achievement in the aircraft power plant!

Basically, an improvement in material must always precede an improvement in design whenever the physical characteristics of the material have been the limiting factors, and the material from which forged heads are machined is no exception. This material is an aluminum alloy of the following composition: copper—3.5 - 4.5; nickel—1.8 - 2.3; magnesium—1.3 - 1.8; silicon—.45 - .90; impurities—1.6 max.; aluminum—remainder.

In choosing this alloy, the characteristics which were specifically sought were:—a material which would possess the best physical properties at elevated temperatures, as far as strength was concerned, and which could be successfully forged and machined. The material finally selected possesses these characteristics after going through the heat treatment subsequent to forging.

Originally, the alloy selected contained only one-half the present percentage of magnesium since, at that time, it was considered impossible to forge it without internal cracks if more than .9% of magnesium was present. However, it was extremely desirable to have this increased magnesium content because it, alone, is particularly responsible for the improved physical properties at elevated temperatures, and closer control of melting and forging has since made forging entirely practical.

In order to improve machinability, the original alloy contained ½% of lead and ½% of bismuth, both of which have been eliminated by development of superior tools and by closer control of grinding practices, coupled with a change in heat treatment, which produces a slightly harder forging. Hardness has now been increased from 65 to 80 Brinell to 90-105 Brinell, and this harder material has proven easier to machine.

As previously mentioned, the purpose of heat treating is to develop the maximum physical properties for the alloy. The heat treatment is very critical, since tool life and finish are dependent upon uniformity of the rough forgings; hence, they are heated to 960°F. ± 10° and held at this temperature for a minimum of ten hours.

They are then cooled uniformly by means of a compressed air blast at room temperature. The parts are then reheated to 475°F. ± 10° and held at this temperature for a minimum of five hours, and cooled in still air. Hardness, after the above treatment, must be 90-105 Brinell. Incidentally, this alloy develops the maximum hardness when quenched in hot water from 960°F.

However, forgings treated in this manner cannot be machined successfully since the quenching strains relieve themselves during the finning operation, resulting in fins which have a tendency to lean away from the finning saw.

*Adapted from a paper presented at Northern New Jersey Chapter, ASTE.

The weight of the rough forging in the "as received" condition is 70 pounds. The weight of the finished head is 30.5 pounds; thus, the net material removed during machining is equal to 56% of the original weight. On cast heads, the rough casting weight is 40 pounds and the finished weight 29½ pounds—a net weight reduction of 26%. However, the major difference in weight loss is due to the forged heads coming with rocker box bosses and fin spaces all solid as compared with the cavities existent in the cast type head.

The first machining operation—finish forming the O.D. of the locating flange—is performed on an engine lathe, with the parts mounted in chucks. They are held on a chucking ring on the base of the forging, and the part is trued up by means of targets and flush pin gauges mounted on the tail stock, and so supported that they may be moved out of the way to allow the machine to operate. Parts are then transferred to a band saw and the chucking riser (oper. 2) cut off, after which (oper. 3) the interior dome is rough and finish formed on a Bullard Multimatic.

Immediately after machining on the Bullard, the head is mounted in a targeting fixture and checked for relationship of the base locating flange, the dome machining, and other vital points. If the head is correct, an index point, to locate at the next operation, is scribed on the base locating flange.

It is important that this operation be performed at this time in order to prevent mistargeted pieces from proceeding further, and also to perform corrective work prior to drilling two locating flange holes (oper. 4) which are drilled and reamed on a special Allen drill, not shown. This is a 3-position indexing machine having 2-spindle heads and three trunion mounted fixtures to facilitate loading. See Fig. 1A for preceding operations.

Parts are loaded in an upright position, locating on the flange diameter and targeted by the scribe line on the locating flange. After clamping, the fixture is inverted to present the base of the flange to the drills. The head is next placed in a Cincinnati-Bickford radial drill and the intake and exhaust valve guide holes, as well as the valve spring washer seats, are bored. The rocker box face is then milled off on a Cincinnati mill.

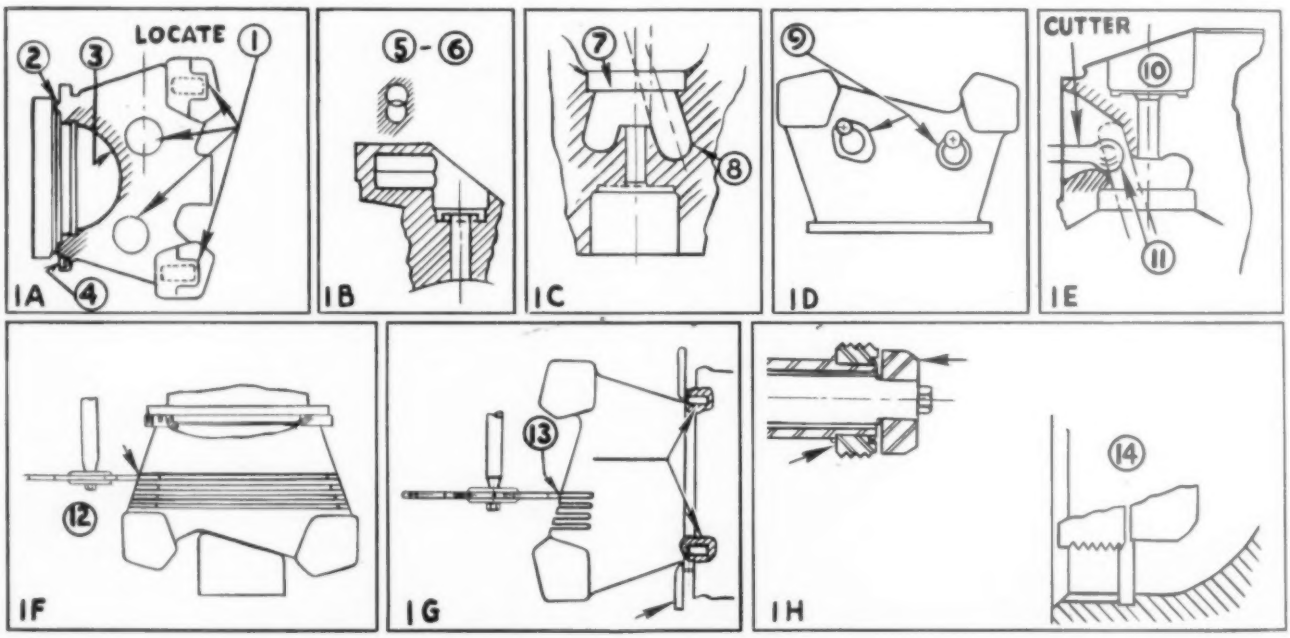
The next operation (5) is to drill and ream intake and exhaust guide holes, then (6) to drill two holes side by side in the rocker box boss. See Fig. 1B. This is done to permit the internal finish profiling operation, which is done on a Cincinnati Hydrotel, and is one of the many operations which require the holding of uniform wall thicknesses; thus, the very accurate targeting of the head at the first operation. The intake and exhaust valve seats are then counterbored (oper. 7).

Machining of Valve Chambers

The next operation (8) consists of machining out the intake and exhaust valve chambers so as to leave a central boss in the form of a truncated cone whose base blends into a full radius and which is in the form of a portion of a helix, so that the height varies progressively from minimum to maximum, and back to minimum. See Fig. 1C.

This somewhat difficult form is generated on a special Snyder machine (Fig. 2) built to Wright designs. The part is held on a rotary fixture inclined at the angle of the valve guide cone, and is located on the valve spring counterbore and rocker box. The form end mill used is .030 smaller in diameter than the required width of the cut, and is fed in to finish depth for the roughing operation as the part makes one complete revolution on the table.

The tool is then set over .015" toward the inner side of the cut for the finishing operation during the next revolution, and then .015" toward the opposite side for the final revolution for finishing the other side of the cut. For the finishing cuts, the direction of rotation of the head is reversed to



Operation sequences. FIG. 1A, Op. 1, part mounted in chuck on engine lathe and targeted (located) at points a,b,c. Turn flange for use for most subsequent operations. Op. 2, cut off chucking collar on bandsaw. Op. 3, rough and finish interior dome and cut groove for thread tool clearance. Dome formed on Bullard Multimatic with generating head and single point tool. Op. 4, drill and ream two locating holes. Special Allen drill.

FIG. 1B, Op. 5. Drill & ream intake and exhaust guide holes; c'bore part of intake and exhaust rocker arm chamber and valve spring washer seat. Op. 6, drill two holes in nose of rocker box—done to allow cutter to enter to finish profile nose of rocker arm chamber. Two parts machined simultaneously on Cincinnati Hydrotel.

FIG. 1C. Op. 7, C'bore intake and exhaust valve seats. Op. 8, Rough and finish mill angle around intake and exhaust valve guide bosses. Special Snyder machine (Fig. 2) with fixture at 16° angle. Cam action moves cutter up and down to vary depth of cut. Tool used is a round nosed end mill with chip breakers in each flute.

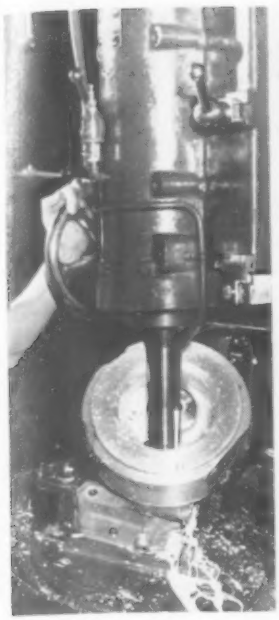
FIG. 1D. Op. 9, profile mill intake and exhaust port faces, two parts simultaneously. Cinci Hydrotel, shown in Fig. 3.

FIG. 1E. Op. 10, mill rocker box cover face. Op. 11, profile mill inside intake and exhaust ports, Cinci Hydrotel (Fig. 4) using 1" dia. ball cutters. Three parts machined simultaneously.

FIG. 1F. Op. 12, mill circular fins, four parts machined simultaneously on 4-spdl Hydrotel using 9" dia. CT-tipped saws running 3000 sfm with .007" feed.

FIG. 1G. Op. 13, cut forty-four dome fins. Fixtures rotate, moving work into saws which run 4000 sfm with feed 75.6" per minute. See also Figs. 5A and 5B.

FIG. 1H. Op. 14, machine cylinder barrel attaching thread. Hall Planetary Mill equipped with special lead screw lock.



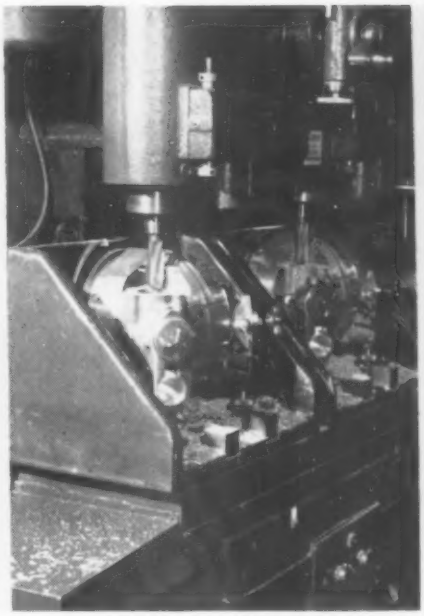


FIG. 2, at left. Rough and finish milling angle around intake and exhaust valve guide bosses on special Snyder machine. Fixture is tilted 16°. See caption, Fig. 1C. FIG. 3, center, profile milling intake and exhaust port faces on Cinci Hydrotel, two parts being machined simultaneously. FIG. 4, right, milling out intake and exhaust ports to connect the valve chambers. One machine roughs, the other finishes, and each is equipped with three individually operated spindles running 6900 RPM. Spindles are inclines at 15° angle but feed is vertical.

produce a climb cutting action and obtain a fine finish. The intake valve chamber is similarly machined on Snyder equipment, but with the table set to suit the different angle.

The faces of the intake and exhaust ports are rough and finish milled (oper. 9, Fig. 1D) on 2-spindle Cincinnati profile millers, shown in Fig. 3, on which the heads are loaded two at a time, locating on the flange and dowel holes and clamped through the intake and exhaust valve guide holes by bolts bearing on the top of the guide boss.

Spiral fluted end mills machine the port faces and the adjacent sides of the head, the movement of the cutters being controlled by a tracer in contact with a master template. After the intake port face on both parts has been machined, the tracer is shifted to a second template for machining the exhaust port faces. Carbide tipped cutters are used, and the operation is performed dry. Following this operation, the intake and exhaust ports are milled out to connect into the valve chambers, Opers. 10 and 11, Fig. 1E.

Profiling machines (Fig. 4) were designed for this purpose, one for roughing, one for finishing. Each machine is equipped with three individually powered spindles, each driven by a high-cycle motor running at 6900 rpm with power provided by a motor-driven high cycle converter. The spindles are inclined at an angle of 15° from the vertical, but feed is vertically downwards.

Milling Problems Overcome

Three cylinder heads are loaded, at one time, and located by means of the base flange and drilled holes. The holding fixtures are linked to a reciprocating bar, to which the master template is also attached in such a manner that the heads rotate through a small arc. As the spherical cutters feed down into the work they travel in an approximately circular path, being controlled by a ball ended tracer operating in the master form.

The curved passage thus generated in the finish cut is remarkably clean and requires only a smoothing operation with abrasive cloth to remove tool marks and blend it into the opening of the valve chamber. Approximately 15 minutes are required to perform the operation on the three heads for the exhaust ports, and a similar amount for the intake ports. In spite of their high speed, the spindles may be stopped in about five seconds by pressing the electric reversing button.

Milling out the fins constitutes one of the most interesting operations, and is achieved by use of special 4-spindle Cincinnati milling machines designed jointly by Wright and Cincinnati engineers. A standard mill was modified by attaching a harness to the table and, by means of weights and pulleys, load on the feed screws was reduced to less than five pounds. Two attachments were connected to the table, one for the vertical movement and one for the horizontal, to cause this to follow a master profile, and the first heads were thus successfully produced.

Considerable trouble was encountered with the cutters. Gang milling proved unsuccessful, and standard milling saws were found to be entirely unsuitable since their harmonic frequency was such that they excited the fins and produced fractures. Special cutters, 13" in diameter and equipped with wire carbide blades, were therefore designed so that the vibration was dampened and excitation eliminated. Carefully ground, and honed to a fine finish, these cutters produce an exceptionally good surface when operating at a surface speed of 4,000 feet per minute and a feed of .007 inches per tooth—or 75.6" per minute. Despite the high speed and feed, these saws have been so carefully worked out that the heat generated is virtually negligible, and both cutter and work piece remain sufficiently cool to be handled without difficulty.

When the machines were first installed it was believed that the centrifugal force produced by the high speed cutters would render it impossible to make any effective use of fluid coolants. The machines were therefore designed to use heavy tallow, as a cutter lubricant, to be fed by compressed air from a container through a flexible tube terminating in a slotted nozzle through which the edge of the cutter passed. An automatic trip operated the air valve to deliver a "shot" of tallow every few seconds.

This was satisfactory insofar as cutting was concerned, but was very wasteful of tallow which spattered and could not be readily recovered. Furthermore, the resulting heavy coating of grease made the parts objectionable to handle. Since then, fluid coolants—made up of water and commercially marketed soluble cutting oils—are used successfully.

The first finning operation—Oper. 12, Fig. 1F—consists of cutting 42 circular fin spaces around the lower part of the body. This is done on a Cincinnati 4-spindle Hydrotel with the cylinder head mounted on a special rotary fixture and locating on the flange diameter and the locating pin holes.

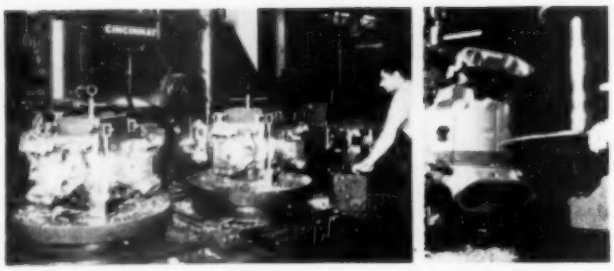


FIG. 5A, at left, is a Hydrotel type machine equipped with two holding fixtures, each mounting four parts, which rotate and feed the work into the saws. The saws are 13" in diameter and run at 4000 sfm with feed about 76" per minute. FIG. 5B, at right, shows saws cutting dome fins.

The grooves are not perfectly circular, nor are all of the same contour; therefore, a master cam is employed to obtain the necessary radial variation of the machine spindle.

At the start of the cut, the saw cuts into the head until the follower engages the cam. The contour is then controlled by the cam which rotates in synchrony with the part and produces the required profile. On this operation, the cutting saws are .081" thick and spaced at the mean thickness of the fin, which is .130". The depth of the cut is about 3.25" at the deepest part.

As previously intimated, four heads are machined at a time on this machine. The saws used are 9" in diameter and have six Tungsten carbide tipped cutting teeth. This saw blade rotates the same direction as the head and at 1500 rpm—or a surface speed of 3,000 fpm. The saw operates at a feed of .007" per tooth, or 61" per minute.

The head is then removed and mounted on another Hydrotel type machine—Figs. 5A and 5B—which has two holding fixtures, each supporting four heads. This operation (Oper. 13, Fig. 1G) is performed to cut the 44 fin grooves in the dome, and the fixtures rotate moving the work into the saws. The saws again move radially back and forth in order to control the depth of cut, the radial variation being controlled by a cam and follower setup.

The cutting saws used on this machine are 13" in diameter and equipped with nine tungsten carbide tipped saw teeth. The saw rotates at 1200 rpm, or 4000 sfm. Again, the feed is .007" per tooth—or 75.6" per minute—and, as in previous operations, fluid coolants are used.

Additional machining of the fins is now performed, with portions of some of the circular fins cut away. The machine used is a Cincinnati Hydro-Matic, with the clipping saws controlled radially, as before, by a cam and follower mechanism. One head is clipped at a time although, in order to clip the dome fins, the heads are reloaded onto another Hydrotel exactly as for the prior finning operation.

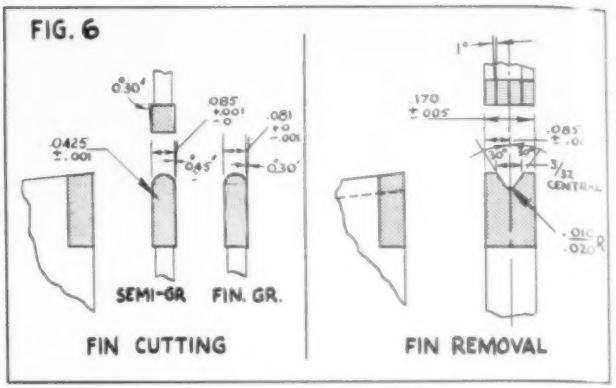


FIG. 6. At left, the fin cutting saws, and at right, the fin removal or clipping saws. These saws are tungsten-carbide tipped, and shown in operation in Figs. 5A and 5B.

This time, however, a different set of cams controls the clipping saws and portions of the head fins are removed. This fin clipping operation is done primarily to save weight and can be done, since, with this type head, there is an overabundance of cooling facility.

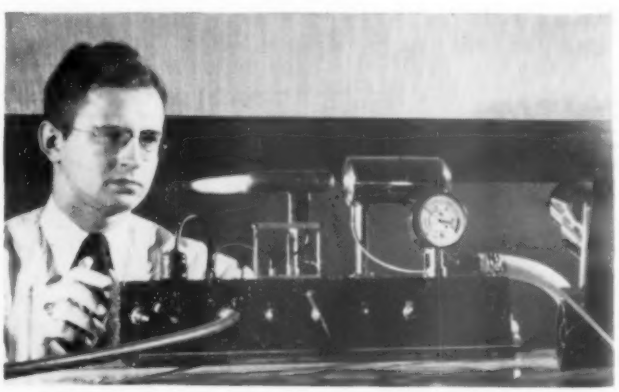
It is interesting to note that, in cutting the 42 circular fin spaces and the 44 dome spaces, the total length of groove cut is approximately 171 ft., .080", and varies from .5" to 3.25" in depth. The weight of material removed in this operation alone amounts to approximately 20 lbs. When doing this type of work the finning saws (shown in Fig. 6) will cut an average of 15 to 18 heads between grindings, depending on whether they are circular fin saws or dome saws. The latter have the greater life.

After completing the finning operation, the next major operation (No. 14, Fig. 1H) is to machine the cylinder barrel attaching threads, in the head. To do this, the head is mounted on a Hall planetary mill equipped with a special lead screw lock. In order to insure concentricity of the barrel pilot diameter and the thread pitch diameter, both operations are performed simultaneously, a specially designed spindle allowing the thread hob to back out along the 6 pitch modified buttress thread helix angle while the cutter stays axially in one position. In both operations, the tools run eccentrically.

With the exceptions of the fin cutting operations and the machining of the rocker boxes, valve ports and some exterior surfaces, all other operations performed on this head are similar to those performed on cast heads. It should be pointed out, however, that the tool machining time on the forged head is greater than for the cast head, but this is more than offset by the remarkable savings occasioned by the elimination of lengthy and tedious foundry operations.

Jet Engineers "Build a Fire"

A TINY RAM-JET ENGINE, "baby" model of the kind that may power future airplanes or missiles, spouts a tongue of flame as it goes into action at the Westinghouse Research Laboratories where scientists are seeking to build the "world's best fire." As engineer Egon DeZubay flips a switch, flame explodes from the rear of the bullet-shaped ram-jet, propelling it forward at a "make-believe" speed of 375 miles an hour. This is comparative loafing for ram-jet engines which operate at greatest efficiency at speeds of about 1,000 miles per hour. Here a projector attached to the model throws on a screen—not shown—the amount of propulsive force, or "thrust," which the ram-jet generates to overcome air resistance. The larger cylinder at right provides a powerful blast of compressed air which the ram-jet normally would pick up on its flight through the air. When this is combined with the gaseous fuel inside the engine, the "fire" is built. A hot stream of gases bursts from the other end of the chamber, propelling the ram-jet at terrific speeds.



Flow of Metal in Drawing Operations*

By J. W. Lengbridge

Installment No. 2 of a Series on the Theory and Practice of Pressing Aluminum

THE FLOW OCCURRING in a drawing operation may be observed by dividing the blank into area units—i. e., into squares or concentric circles—and noting the change which takes place on those units as a result of drawing. If a flat blank is marked with scribed lines so as to divide it into area units, the marked blank then drawn into a die and the change in the shape, size, and position of the units noted after drawing, evidence of flow would be seen in all those area units which make up the side wall and top flange of the shell. The units located on the outer edge of the blank would show the greatest change, while those in the central area would show little or no change.

If the shell were circular, there would be evidence of uniform movement on all diameters. If rectangular, there would be evidence of drawing flow in the four corners, and bending flow in the sides and ends between the corners. If it were an irregularly shaped shell, the change in the area units would indicate greater flow at points of severe draw than at points of a mild change in shape.

If the metal, the blankholding control, and the tooling were right, the walls of the shell would be smooth, the metal at the radii of the shell would not be strained or reduced in thickness, and there would be only a minor difference between the thickness and surface area of the shell and the blank from which it was drawn. Areas involving severe flow, however, are subjected to severe compressive stresses which tend to increase the thickness, and while this change is of a minor nature it tends to cause a slight reduction in the surface area.

The experiments which form the basis of these data were made with blanks marked into units of area as a means of observing the flow. The results suggest that, in a drawing operation, the flow of metal necessary to bring about a reshaping of the blank into a seamless cup has the following characteristics:

(1) *The flow is proportional to the applied stress.* Those units requiring maximum flow to reshape and reposition them will involve higher stresses than those units in which little movement is necessary. For instance, the area units on the outer edge of a blank will undergo considerably more change than those units closer to the center of the blank. Stresses cause the flow and, if the flow is greater, the stresses necessary to cause it must also be greater.

(2) *Flow causes a three dimensional change in each area unit which results in a change in its shape. These changes are proportional to the flow.* The dimensional change is of a major nature in the length and width of the unit, and of a minor nature in thickness. For example, if we draw a 10" diameter blank into a 6" diameter die, all those area units on the outer edge of the blank must be crowded into a 6" diameter circle. This means that the length of each unit must be reduced; and, because the surface area remains the same, except for the modifying effect of a slight change in thickness, the width of each unit must increase in proportion to decrease in length. Those units on the blank located close to the 6" diameter would not require as much flow to reposition them, and consequently would undergo a smaller change in shape and dimensions.

(3) *Flow takes place under both compressive and tensile stresses.* The act of reducing the circumference of a blank crowds each unit of area against the adjacent metal, and induces compressive stresses in all the metal being moved towards the die radius. The punch actuates the movement of metal by pressing on the bottom of the shell. The compressive stresses at work in the flow area, the resistance to movement over the die radius, and the blankholding pressure, etc. all constitute flow retarding factors which resist this movement. Thus we have two forces opposing each other. One trying to pull the metal into the die, and the other trying to hold the metal back. The metal in the side wall of the shell is between those two forces and is stressed in tension. The direction of the stresses in a drawing operation is shown in Fig. 17.

(4) *The flow is uniform when the stresses are balanced.* A circular blank drawn into a circular die will, when the conditions are correct, produce a shell of a uniform height. Corresponding units of area, on any diameter, will undergo the same change in shape and dimensions and will require the same flow control and drawing pressure on each side of the shell. The flow occurring in a drawing operation may be affected by such factors as friction, due to careless lubrication of the blank, or rough surfaces on the tools; but, if for any reason flow is retarded, the shell will be pulled thin or fractured at the top or bottom radii because these are the points of highest stress.

Zones of Flow in Circular Draws

The flow in a circular shell is not as complex as the flow in an irregularly shaped shell, and while some flow characteristics are common to most drawn shapes, each has its own peculiarities. We will consider first a few of the facts concerning circular shells.

The changes in the flow lines, on a marked blank which has been drawn into a die, suggest that there are two sharply defined flow areas: (1) The area of minimum flow (or bottom area), which is confined within a circle equal in diameter to the punch diameter. (2) The area of maximum flow, which extends from the above diameter to the outside edge of the blank.

In the area of minimum flow, little or no change occurs to the marking as a result of drawing, indicating little or no flow in this area. This characteristic is typical of all free drawing operations when there is no embossing or similar cold work done on the bottom of the shell.

In the area of maximum flow, the lines outlining the area units undergo considerable change and, the closer these lines are to the outer circumference of the blank, the greater will the change be. The magnitude of the change in the size of shape of any area unit, is indicative of the amount it has been made to flow.

The change occurring in any selected unit, in the area of maximum flow, may be divided into two kinds: (1) A

* This series of articles is a collaboration between the author, Mr. Lengbridge, and Aluminium Laboratories, Ltd., of Kingston, Ontario.

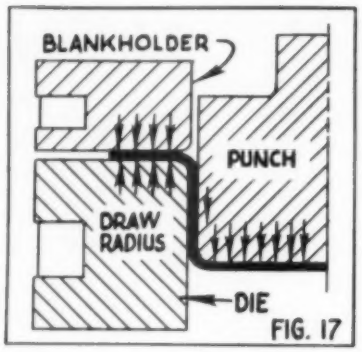


FIG. 17

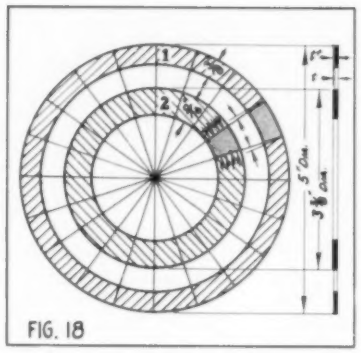


FIG. 18

FIG. 17, left, shows stresses on the metal as a drawing operation. FIG. 18, right. Diagram showing the dimensional changes in area units moving toward the die radius.

FIG. 19. Photograph of a partly drawn shell showing dimensional change in area units.

dimensional change, occurring in the unit as it is being drawn towards the center of the die, but before it passes over the die radius. (2) A shape and a further dimensional change, occurring in the unit as it passes over the die radius.

Flow to the Radius

The first change is illustrated in Fig. 18, in which a ring of 20 area units is shown on the outer edge of a 5" blank, and a smaller ring (representing the same group of units) which has been drawn towards the center of the die, but not into it. Each of these units must move in a radial direction within its own radial boundaries, thus becoming circumferentially shorter. Its width, measured radially, increases in proportion to the decrease in length, and the general shape of the unit remains the same.

This progressive crowding of the length of each unit into shorter radial boundaries induces compressive stresses in this area which, when controlled, will keep the metal movement parallel to the die face. The metal movement parallel to the face of the die is more or less unrestrained, thus permitting flow in this direction as well as a major change in shape. The metal movement in a vertical direction is restrained by the blankholding pressure, and this permits very little flow in this direction, and only minor change in thickness.

If too much freedom of movement is permitted in a vertical direction, the compressive forces at work will cause the metal to buckle in the form of radial ridges called wrinkles, which will retard the flow. The 20 units shown in Fig. 18 have changed in size during the movement from the outer ring to the inner ring. They become shorter circumferentially and wider radially, but very little change occurs in the surface area.

In order to obtain specific data on the flow occurring in a drawing operation, an experiment was made, and the results are shown in Fig. 19. Two $5\frac{1}{8}$" diameter blanks were marked with radial lines and concentric circles, and drawn into a $2\frac{5}{8}$" diameter die.

The change in the area units due to flow may be summarized as follows: (1) The marked units on the flange of the shell are still within the same radial boundaries, but because these boundaries converge as they approach the center, the circumferential length of each unit has been reduced from $\frac{3}{4}$" to $\frac{1}{2}$". (2) The width of each unit measured radially, was $\frac{1}{4}$" before drawing, and increased to $\frac{5}{16}$" after drawing. (3) The thickness of the metal in this ring of units has increased from .029" to .034".

If these areas are calculated before and after drawing, it will be found that the surface area of this ring of units is less after drawing than before, and this is accounted for by an increase in thickness from .029" to .034". It will also be found that, because the increase in thickness is accompanied by a decrease in surface area, the cubic area of the ring of units under observation remains the same after drawing as before. The sizes before and after drawing are tabulated below:

Outer Band of Area Units	Before Drawing	After Drawing
Size	5" O.D. × $4\frac{1}{2}$" I.D.	$3\frac{7}{8}$" O.D. × $2\frac{1}{8}$" I.D.
Surface area	3.72 sq. ins.	3.16 sq. ins.
Thickness	.029"	.034"
Cubic Area	3.72 × .029 = 10.78 cu. in.	3.16 × .034 = 10.74 cu. in.

The 15% reduction in surface area of the outer band of units, as well as the 17% increase in thickness, is the maximum change which would occur in a draw of this diameter and thickness. It is maximum because the area under observation is the area of maximum flow. The percentage decrease in area and increase in thickness would taper off to zero at that circle on the blank which was equal to the shell diameter.

In other words, in this experiment, those units of area on a $2\frac{5}{8}$" diameter would involve little or no flow, and there would be little or no change in area and thickness. The overall change in surface area would be much less than 15%, and the same applies to the thickness increase. The trimming allowance usually more than takes care of the slight loss of shell height caused by a thickness increase.

The radial boundaries remain radial until they are moved over the die radius, then they become parallel, and also remain parallel no matter how far they are drawn into the die. The thickness tends to increase until the unit reaches the die radius but, after it moves over the radius, no further increase occurs.

If the thickness increases more than the space or clearance between the punch and die walls, it will be ironed down to this clearance allowance, and metal so ironed will appear on the shell as a bright burnished band. Under normal conditions, this band will only appear at the top of the side wall of the shell since, being the area of maximum flow, it would consequently be the area of greatest increase in thickness.

Flow Over the Die Radius

The areas of minimum and maximum flow, and the changes occurring in these areas, are illustrated in Fig. 20 to show a group of area units before and after drawing. The bottom area, which is confined within a 5" diameter circle, undergoes no change in shape because there is no metal movement in that area. The area of maximum flow is the metal outside the 5" diameter, extending to the edge of the blank, and this area supplies the metal which makes the side walls and top flange of the shell. The parallel sided area units A_1, B_2, C_3, and D_4 were, on the blank, area units 1, 2, 3, and 4 located in area bands A, B, C, and D, respectively.

These parallel sided units are all the same circumferential length after drawing, but increase in depth as their location

proaches the top of the shell, because the closer their cation before drawing was to the outside edge of the ank, the greater would be their area. The shaded area the flat blank is 7¼" O. D. × 6½" I. D. This same ea appears on the shell as a section of a tube, 5" in diamter × .52 deep, and the surface area of these two sections, a drawing operation, would be approximately equal. The eneral change due to flow may be summarized as follows:

(1) Little or no change in the bottom area, because no cold work is done in this area of minimum flow.

(2) Maximum change in that area of the blank which supplied the metal for the side walls and top flange of the shell.

(3) All circumferential boundaries of the units of area retain their circular form and remain parallel throughout the draw.

(4) All radial boundaries of the units of area remain radial in the bottom area throughout the operation. They remain radial in the top flange area until they move over the die radius; they then become parallel, and assume a spacing equal to their spacing at the point where they move over the die radius.

(5) There is a slight decrease in surface area, and an increase in thickness in the units involving maximum flow.

(6) The increase in thickness is limited to the space allowed between the punch and the die walls. This space is usually 8% to 12% greater than the original metal thickness, and this is sufficient to allow freedom of flow without undue wall friction. The only area which may thicken to a degree greater than the die space, is the extreme outer area of the blank, and this necessitates a minor ironing of the excess thickness in this area as the metal is drawn into the die.

(7) The flow lines on this circular shell indicate that the metal movement on shells of a circular shape is uniform on all diameters.

Progressive Change in Shape

A step by step idea of the flow in the circular shells may be gathered from Fig. 21, in which the units within one pair of radial boundaries has been numbered, and each unit moved progressively towards the center in three steps. If a shell were to be drawn in this manner and examined at each of the depths shown, it would show the gradual narrowing of length and the increase of radial width, as well as no change to area 1 and maximum change to area 5. It would also show that after unit 2 moved over the die radius, no further change would occur in either shape or dimensions,

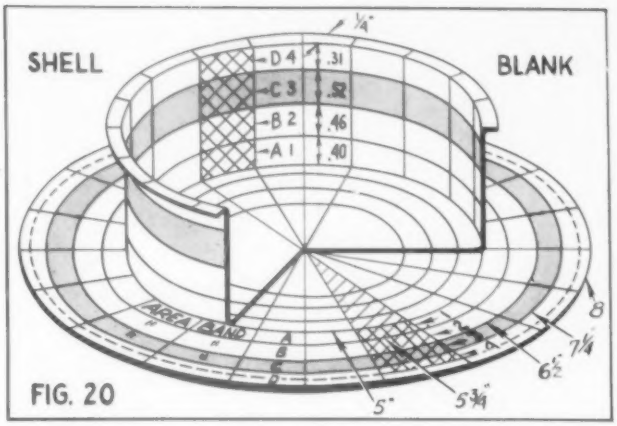


FIG. 20

FIG. 20, above, shows change in the shape of area units because of flow. FIG. 21, below, shows step-by-step flow.

and this would apply to any other units which were drawn in. Area 3 would be deeper than 2, because area 3 was originally larger than area 2. Area 4 would be deeper than area 3 for the same reason.

Fig. 23 is a photograph of a blank and three draws from blanks of the same size and marking. In this case, the shells were drawn so that the marking appeared on the inside of the shells; they were then cut open and alternate area units painted black. The progressive change in the shape and size of the marked units is proportional to the change in the size of the shell. As the circumferential length of the units increases, the depth of the shell increases. The greatest change occurs in the extreme outer units of area.

Amount of Change in Shape

The relative amount of movement in one unit or a group of units is shown in Figs. 22A and 22B, in which two methods of marking are used to illustrate the size, shape, and position of the units of area, before and after drawing. If the triangular portions of the blank in both views A and B were maked as shown (A with radial lines and concentric circles, B with squares) and then, after drawing these blanks, we cut the sections out of the shells, flatten them, and compare them with our original triangular blank portions, we would find that the shape of the triangular pieces had changed as shown. In view A unit 3 enclosed within a, b, c, and d would after drawing be enclosed in the area e, f, g, and h. The overall length of the triangle would have increased as shown.

FIG. 22A, center. Shape and dimensional change due to flow in a group of square units of area. FIG. 22B, right. Same changes in a group of circular area units. Both illustrations show metal flow in a typical group of area units during the drawing of a circular shell marked respectively with squares or concentric circles.

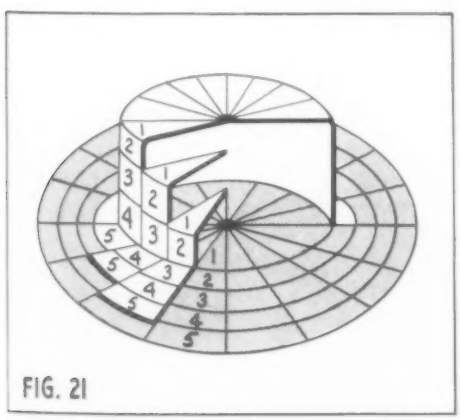


FIG. 21

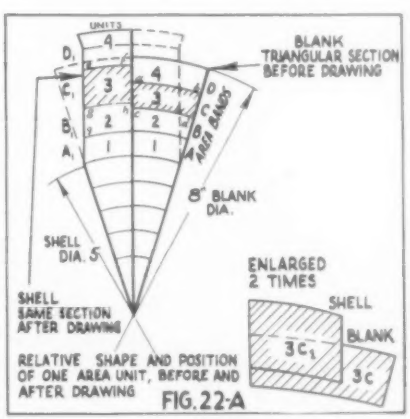


FIG. 22-A

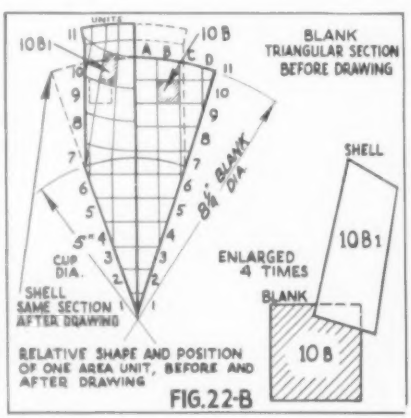


FIG. 22-B

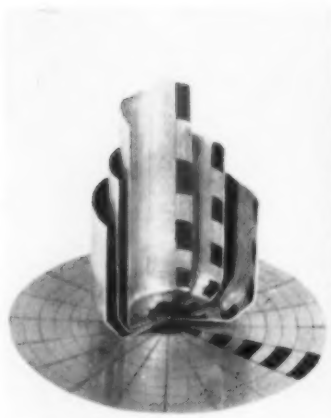


FIG. 23. Photograph showing changes in column of area units.

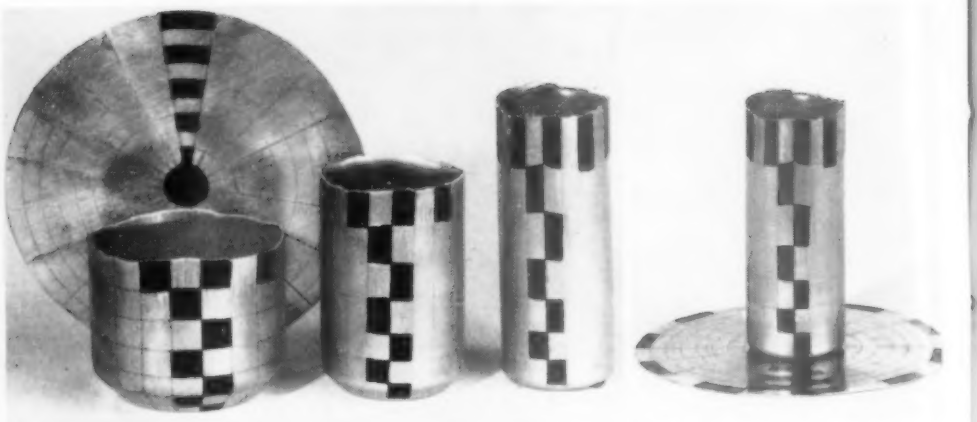


FIG. 24 left, shows progressive change of shape to area units by redrawing. FIG. 25, right, shows magnitude of changes to area units as a result of drawing.

A blank section marked as in view B would show the same change, but this method of marking would possibly show more clearly the amount of movement involved during the operation. The square unit 10b selected at random would appear after drawing similar to the elongated shape shown at 10b$_1$, and it would be located on a 5″ diameter. Movement like this is occurring in a greater or lesser degree all over the flow area, and to produce uniform results in flow, the factors which interfere with normal movement must be known and controlled.

Flow in a Series of Draws

In order to observe the flow in a series of draws, several marked blanks were drawn to 2 5/8″ diameter in one operation, reduced in size to 1 15/16″ in diameter by redrawing, and again reduced to 1½″ in diameter in a second redrawing operation. The results are shown in Fig. 24, in which the change in a group of units on the blank may be followed through several drawing operations.

On this particular blank, these units are approximately ¾″ long and ¼″ wide. On the third operation shell, the ¾″ dimension has been compressed into a ¼″ space. The metal compressed has moved at right angles to the direction of the compressive forces, towards the center of the unit, and this has caused a lengthening of the original ¼″ dimension to ¾″. The change occurring in all the other units of area is proportional to the amount of flow necessary to reshape it.

Under perfect conditions, the top edge of the shell would be the same depth all around. A series of high and low points may exist because the metal has directional properties or, because of a variation in thickness, uneven blank-holding pressure, etc. The circumferential boundaries of the area units will rise and fall with the contour of the top edge of the shell.

The tabulated dimensions of actual measurements of the experiment shown in Fig. 24 are listed below:

	Blank	1st Draw	2nd Draw	3rd Draw
Diameter	5 1/8″	2 5/8″	1 15/16″	1½″
Thickness	.029″	.034″*	.034″*	.034″*
% Reduction in Diameter	....	49%	27%	22%
Width between Radial Boundaries	¾″ to ¼″	7/16″	5/16″	¼″
Width between Circumferential Boundaries	¼″	11/16″ at Bott. 7/16″ at Top	9/16″ at Bott. 5/16″ at Top	11/16″ at Bott. ¾″ at Top
Theoretical Depth		1¾″	3″	4″
Actual Depth Average		1 5/16″	2 1/16″	3.9″

NOTE: These draws are limit draws, and some of the first operation shells were slightly "Eared". These ears were trimmed off before the second reduction, and this accounts for the top band of units in the second operation shell being shorter than the row below it. The metal, however, did not have pronounced directional properties.

Magnitude of Flow in 3 Draws

The magnitude of the change in shape of each area unit is clearly evident in Fig. 25, in which the finished shell is placed in the center of the original blank, with the blackened units shown in their relative positions both before and after drawing. These units close to the center, requiring little flow to reposition them, show minimum change. Those units on the outer edge of the blank, which are drawn from the edge of a 5⅛″ diameter circle to the edge of a 1½″ diameter circle, show a decided change in shape; and the compressive forces at work in the three drawing operations, necessary to draw a 1½″ diameter shell from a 5⅛″ blank, have crowded these outer units into 1/3 their original width, and caused this metal to flow in such a manner that the depth is three times as much as it was on the original blank, thus maintaining a more or less constant area.

We stated in connection with Figs. 19 and 20 that the radial lines become parallel on the side walls of the shell, and are spaced at the minor width of that unit lying on a circle equal in diameter to the die size. The arrangement of shell and blank in Fig. 25 emphasizes this fact.

If the blank is marked with squares to represent the area units as shown in Fig. 20, the amount of movement is perhaps more clearly shown by the distortion of the squares. This method of marking shows, in common with the other method, little or no movement in the bottom area and considerable flow in the sidewall area. A typical row of units in the flow area of the blank is confined between two straight parallel lines, and this row would appear on the shell after drawing confined between two curved non-parallel lines.

If a row of units is selected closer to the center line, and at right angles to the first row, we would find as before no change in the bottom area. Where flow does occur, the long confining lines would begin to converge and lean towards the center line. These two rows show the change in shape from square units to rectangular, diamond, or irregular shapes, depending on their position on the original blank.

The foregoing discussion pertains mainly to circular shells in which the flow is balanced across any diameter. The next step will be to discuss the flow which occurs in the drawing of rectangular shells.

END OF PART 2, this series. Part 3 will follow in the August Issue, THE TOOL ENGINEER.

By **Emil Kuhn**

Cutting and Fragmentation Formulae

A Review of the Results of Studies made by the Author and other Contemporary Investigators

Concluding Installment

For the shaping of cast iron, only a few experiments are available as compared with the shaping of steel and cast steel. Values for the cutting pressure, while not exactly contradictory, nevertheless show considerable discrepancies. Furthermore, the expressions "soft, medium and hard" often used in connection with cast iron are subject to differences in interpretation. Of greatest value in the grading of cast iron is the determination of the Brinell hardness (H), which usually ranges between the values of 115 to 350 or 400.

Review of the Most Important Experimental Results on Cutting Pressure

Fred W. Taylor:
for *cast iron (hard)*,

(28) $\ldots . P = 138\ (t)^{1.4/1.5}(s)^{3/4}$

$= (130 \text{ to } 180)\ (f)^{0.84}$, for t/s=approx. 1/3 to 11

Note that, because of the use of turning steels with curved edged cutters employed by Taylor, the cutting depth (t) and the feed (s) had to be taken into consideration.

for *cast iron (soft)*,

(29) $\ldots . P = 88\ (t)^{1.4/1.5}(s)^{3/4}$

$= (80 \text{ to } 120)\ (f)^{0.84}$, for t/s=approx. 1/3 to 11

Prof. Friedrich:
for *cast iron (hard)*,

$$(30) \ldots . k_s = 57 + \frac{210}{\sqrt{f}}$$

and by conversion,

$$P = 252\,(f)^{0.73}$$

for *cast iron (soft)*,

$$(31) \ldots . k_s = 55 + \frac{71}{\sqrt{f}}$$

and by conversion

$$P = 123\,(f)^{0.82}$$

More recent experiments yielded consistently higher exponents for the chip section:

Prof. Schlesinger: Cast iron, soft: ..... $P = 100\ (f)^{0.9}$
Dr. (Ing.) Klopstock: Cast iron, soft: ..... $P = 96\ (f)^{0.87}$
Dr. (Ing.) Kronenberg: Cast iron, soft: ..... $P = 87\ (f)^{0.87}$

The most recent experiments showed for cast iron of H = 220 the formula,

(32) $\ldots . P = 190\,(f)^{0.89}$

From all these experiments, the following average values may be obtained:

Cast iron, soft
When H = 120 to 150 (average H = 135),
then $P = 89\,(f)^{0.88}$; and
when H = 150 to 180 (average H = 165),
then P = about $120\ (f)^{0.88}$

Cast iron, medium
When H = 180 to 240 (average H = 210),
then $P = 170\ (f)^{0.88}$

Cast iron, hard
When H = 250 to 350 (400) (average H = 300),
then $P = 252\ (f)^{0.88}$

From these data, the following most probable relationship between the cutting pressure and the Brinell hardness of the material can be established:

(33) $\ldots . P = 1.8\ (0.1H)^{1.5}\ (f)^{0.88}$

Concerning the influence of the cutting speed upon the cutting pressure, so far no experiments are known to have been made*. It is, however, absolutely certain that such an influence exists. In any case, however, it would be an error to express this influence by decreasing the chip section's power exponent, because the cutting pressure is mostly decreased with the highest cutting speeds which are only possible with the smallest chip sections.

For this reason, the aforementioned formula has been generally accepted for the shaping of material with high speed steel as well as with cemented carbide.

Shaping With High Speed Steel

The most reliable values for the determination of tool life speeds are probably derived from experiments conducted by Wallichs-Dabringhaus. From this research material, the writer has derived the following generalized formula for the shaping of material with a turning tool of 18% tungsten, 2.5% cobalt, and 1.6% vanadium:

$$(34) \ldots . V_{60} = \frac{3300\ (t \cdot s)^{0.1}}{(0.1\,H)^{1.68}\ (f)^{0.3}}$$

The cutting pressure was inserted as previously derived, viz.

$$P = 1.8\ (0.1H)^{1.5}\ (f)^{0.88}$$

From these two factors, the effect at the tool (Nw) may be now calculated as follows:

$$(35) \ldots . N_w = \frac{1.32\ (t \cdot s)^{0.1}}{(0.1\,H)^{0.18}}\ (f)^{0.58}$$

and the chip section (f):

$$(36) \ldots . f = \frac{(0.1\,H)^{0.31}}{1.61\ (t \cdot s)^{0.17}}\ (N_w)^{1.72}$$

* This problem is at present under investigation.

The chip output (S_L) is therefore

$$(37) \ldots S_L = V_{60} f = \frac{2360 (N_w)^{1.2}}{(0.1 H)^{1.46} (t/s)^{0.02}}$$

and finally the tool life speed expressed in Brinell hardness and effect at the tool is found to be

$$(38) \ldots V_{60} = \frac{3800 (t/s)^{0.15}}{(0.1 H)^{1.77} (N_w)^{0.52}}$$

On the basis of these formulae, it is possible to set up a diagram in the pattern of Graph II for any combination desired. It is moreover possible in the same way to determine relationships of the various factors for other tool lives or other alloyed tools.

Assuming a ratio of the cutting depth (t) to the feed (s) of 8 as a general average value:

$$(39) \ldots N_w = \frac{1.63}{(0.1 H)^{0.18}} (f)^{0.58}$$

$$(40) \ldots f = \frac{(0.1 H)^{0.31}}{2.31} (N_w)^{1.72}$$

$$(41) \ldots S_L = \frac{2260}{(0.1 H)^{1.46}} (N_w)^{1.2}$$

$$(42) \ldots V_{60} = \frac{5220}{(0.1 H)^{1.77} (N_w)^{0.52}} = \frac{4070}{(0.1 H)^{1.68} (f)^{0.3}}$$

Shaping With Cemented Carbide H_1

While there are numerous instruction sheets for the use of cemented carbides, there are no definite experiments from which the tool life speeds may be derived.

The writer has been able, on the basis of his experiences in the workshop as well as from the perusal of the various technical articles dealing with the subject, to derive the following formula for the tool life speed of V_{240}:

$$(43) \ldots V_{240} = \frac{1400 (t/s)^{0.08}}{(0.1 H) (f)^{0.2}}$$

which conforms with most experimental facts.

Comparing this with the formula V_{480} for steel, it will be seen that the influence of the ratio t/s is somewhat decreased (in analogy to the formulae (7) and (8) for V_{60}.) But a considerable decrease is noted in the influence of the Brinell hardness. The writer, therefore, introduces a table which shows the customary limiting values used in the workshop referring to the various chip sections (f) and chip compositions in terms of the ratio t/s:

Cut	H up to 180	H = 180 to 250	H = 250 to 350
Roughening	V_{240} = 60 to 90	40 to 70	30 to 50
Polishing	90 to 130	70 to 100	50 to 70

As originally assumed, the cutting pressure (P) is taken as

$$P = 1.8 (0.1 H)^{1.5} (f)^{0.88}$$

For the shaping of materials with cemented carbide H_1.

$$(44) \ldots N_w = 0.56 (f)^{0.68} (t/s)^{0.08} \left(\sqrt{0.1 H}\right)$$

$$(45) \ldots f = \frac{(N_w)^{1.47}}{0.42 (0.1 H)^{0.74} (t/s)^{0.12}}$$

$$(46) \ldots S_L = \frac{2780 (N_w)^{1.18}}{(0.1 H)^{1.59} (t/s)^{0.014}}$$

$$(47) \ldots V_{240} = \frac{1180 (t/s)^{0.1}}{(0.1 H)^{0.85} (N_w)^{0.29}}$$

and with the cutting ratio of t/s = 8:

$$(48) \ldots N_w = 0.66 (f)^{0.68} \left(\sqrt{0.1 H}\right)$$

$$(49) \quad f = \frac{(N_w)^{1.47}}{0.54 (0.1 H)^{0.74}}$$

$$(50) \ldots S_L = \frac{2700 (N_w)^{1.18}}{(0.1 H)^{1.59}}$$

$$(51) \ldots V_{240} = \frac{1460}{(0.1 H)^{0.85} (N_w)^{0.29}} = \frac{1650}{(0.1 H) (f)^{0.2}}$$

Conclusion

Finally, it is to be noted that the foregoing relationships have been worked out with the purpose of gaining a rapid orientation in the workshop with reference to its management and to the various calculations involving the output of lathes, maximal chip sections with their corresponding (economic) cutting speeds, and so on. All these data can be easily secured by the setting up of suitable diagram for each specific case.

In order not to complicate the article any further, may it be briefly stated that in all cases an entering angle of $k = 45$ degrees has been accepted as a norm. A smaller entering angle, as for example 30 degrees, will necessitate a lengthening of the cutting edge (corresponding to a higher value of the cutting ratio t/s) and results in an increase of tool life speed. A larger entering angle, conversely, necessitates a shortening of the cutting edge and therefore results in a decrease of the tool life speed.

MULTIPLICATION FACTORS FOR SHAPING STEEL

High Speed Steel Tool					Cemented Carbide Tool				
Entering angle	45°	30°	60°	90°	Entering angle	45°	30°	60°	90°
Factor for V_{60}	1	1.2	0.82	0.7	Factor for V_{240}	1	1.07	0.95	0.91

FOR SHAPING CAST IRON

Entering angle	45°	30°	60°	90°	Entering angle	45°	30°	60°	90°
Factor for V_{60}	1	1.15	0.9	0.73	Factor for V_{240}	1	1.05	0.96	0.93

For the cutting with cemented carbide, a tool nose radius (r = 1 mm was chosen as an average value. Also, a larger radius of the tool nose (up to 3 mm) corresponds to a longer cutting segment and leads correspondingly to an increase of the tool life speed (up to maximally 9%). With moderate deviations, all these changes of the cutting speed play but a subordinate role, because at a certain effect (NM), the chip output remains practically constant even though the two factors, namely cutting speed (V) and chip section (f), may change moderately (up to 10%). In other words, V may be increased up to 10% provided f is proportionately decreased so that the equation $S_L = V \times f$ still will hold.

DRILLING

In comparing cutting pressures of drilling with those of lathe work, the chip section in drilling was basically taken as ds/4 for one cutting edge and not as ds/2, as customarily taken for both cutting edges. Moreover, in calculating the cutting pressure from the torque, in consideration of the cross cutter, the torque level has been assigned an average value of 0.7 d, rather than d/2 (half the diameter of the drill). Thus, the experimental results obtained by Dempster, Smith-Poliakoff, Schlesinger, Stoewer, Boston, and Oxford and Wallichs, Bentel and others were recalculated on the basis of the aforementioned standards, and the cutting pressures were calculated (as in turning) according to the cutting pressure formula $P = p_1 \ (f)^x$, the symbols having retained their original meaning.

It thus appeared that the power exponent (x), in the majority of cases, was lower in drilling than in turning. Furthermore, the cutting pressure resulting from lathe work had to be increased by about 15% for materials such as steel, cast steel or chrome-nickel steel, and by about 5 to 7% for cast iron, malleable cast iron or brass, on account of the chip and fibre friction.

In the table below and to the left, the average values are presented as they result from the aforementioned experiments, keeping in mind that the chip section is to be taken as ds/4.

VARIATION OF CUTTING PRESSURES IN DRILLING

Material	kg/mm²	P in kg
Steel	σ_B = 34 to 42	370 × $f^{0.84}$
Steel	σ_B = 42 to 50	415 × $f^{0.84}$
Steel	σ_B = 50 to 60	450 × $f^{0.84}$
Steel	σ_B = 60 to 70	500 × $f^{0.84}$
Steel	σ_B = 70 to 85	550 × $f^{0.84}$
Steel	σ_B = 85 to 100	620 × $f^{0.84}$
Cr-Ni steel		580 × $f^{0.84}$
Cast steel		400 × $f^{0.84}$
Malleable cast iron		290 × $f^{0.75}$
Cast iron, soft		200 × $f^{0.85}$
Cast iron, medium		290 × $f^{0.85}$
Cast iron, hard		380 × $f^{0.87}$
Brass		150 × $f^{0.82}$
Aluminum alloys		150 × $f^{0.86}$

DIRECTORY OF SYMBOLS*
USED IN FORMULAE ON DRILLING

P = Main cutting pressure in kg (for both cutters)
d = Diameter of the drill in mm
s = Feed per revolution in mm
f = Chip section in mm²

* Other symbols used in drilling formulae are interpreted the same as for lathe turning and may be found in the preceding directory.

MILLING

The cutting pressure in milling for 1 mm milling width can be represented, analogously to the cutting pressures in turning and drilling, by the formula

(52) . . . . $P = C\,(h_M)^x$

To calculate the average thickness of the chip, the well known formula

(53) . . . . $h_M = \frac{s^1}{nz}\left(\sqrt{a/d}\right) = s_z\left(\sqrt{a/d}\right)$

was used.

The effect at the milling spindle (Nw) in horsepower was determined in customary fashion, by the average specific cutting pressure (kM):

(54) . . . . $k_M = \frac{C\,(h_M)^x}{h_M} = \frac{C}{(h_M)^{1-x}}$

according to the well known formula

(55) . . . . $N_w = \frac{k_M}{4.5 \times 10^6}$ abs¹

DIRECTORY OF SYMBOLS*
USED IN FORMULAE ON MILLING

a = Milling depth in mm
b = Milling width in mm
C = A constant depending upon the material
d = Diameter of milling cutter in mm
k_M = Average specific cutting pressure in kg/mm²
h_M = Average chip thickness
n = Number of revolutions of milling cutter
s^1 = Feed in mm/min
s_z = Feed per tooth of milling cutter
z = Number of teeth of milling cutter

* Other symbols used in milling formulae are interpreted the same as for lathe turning and may be found in the first directory of symbols.

All milling experiments conducted since 1931 yielded values for the average cutting pressure (P) and the specific cutting pressure (k_M) as exposed in the following table:

VARIATIONS OF CUTTING PRESSURES IN MILLING

Material	σ_u in kg/mm²	P in kg	k_M in kg/mm²
Steel	34 to 50	$145 \times h_M^{0.75}$	$145 \times h_M^{-0.25}$
Steel	50 to 60	$150 \times h_M^{0.75}$	$150 \times h_M^{-0.25}$
Steel	60 to 70	$155 \times h_M^{0.75}$	$155 \times h_M^{-0.25}$
Steel	70 to 80 Stg. 52.81	$155 \times h_M^{0.75}$	$155 \times h_M^{-0.25}$
Steel	90 to 120 (ECN 35)	$170 \times h_M^{0.75}$	$170 \times h_M^{-0.25}$
Steel VCN 15 VCMow		$155 \times h_M^{0.67}$	$155 \times h_M^{-0.33}$
Steel VCN 35 h VCMo 140		$160 \times h_M^{0.67}$	$160 \times h_M^{-0.33}$
Cast iron 26.91		$110 \times h_M^{0.7}$	$110 \times h_M^{-0.3}$
Cast iron 18.91 (soft)		$95 \times h_M^{0.7}$	$95 \times h_M^{-0.3}$
Brass, red brass		$37 \times h_M^{0.5}$	$37 \times h_M^{-0.5}$
Elecktron		$10.2 \times h_M^{0.4}$	$10.2 \times h_M^{-0.6}$

Example: Steel of 60 to 70 kg/mm² tensile strength is to be rough milled with a cylindrical cutter:

Diameter of milling cutter	d	= 100 mm
Number of teeth	z	= 10
Number of revolutions	n	= 50
Feed	s^1	= 90 mm/min
Milling depth	a	= 4 mm
Milling width	b	= 100 mm

The average chip thickness is

$$h_M = \frac{s^1}{nz}\left(\sqrt{a/d}\right) = \frac{90}{50 \times 10}\left(\sqrt{4/100}\right) = 0.036$$

the average specific cutting pressure is

$$k_M = 155 \times 0.036^{-0.25} = \frac{155}{0.435}$$

$$= 356 \text{ kg/mm}^2$$

and the effect at the milling spindle is

$$N_w = \frac{k_M}{4.5 \times 10^6} \text{ abs}^1 = \frac{356}{4.5 \times 10^6} 4 \times 100 \times 90$$

$$= 2.85 \text{ HP}$$

Finally, it should be emphasized that the chip output in cm³/HP/min, calculated on the basis of the k_M formulae, are in excellent agreement with the most recently obtained corresponding values.

BIBLIOGRAPHY

Codron, "Experiences sur le travail des machine-outils pour les metaux." Dunot et Pina, Paris 1906.

Fred W. Taylor, "On the art of cutting metals," Philadelphia 1907.

Prof. Friedrich, "Ueber die Wärmevorgänge beim Spanschneiden und die vorteilhafte Schnittgeschwindigkeit," Zeitschr. des Vereins deutscher Ingenieure, 1914.

Prof. Ripper, "Cutting power of lathe turning tools. *Engineering* 1913, page 715, 737.

W. Hippler, "Dreherei und ihre Werkzeuge," Jahrg. 1923.

Dr. Ing. W. Klopstock, "Die Untersuchung der Dreharbeit," Werkstatts Technik 1923.

Dr. Ing. Kronenberg, "Grundzüge der Zerspanungslehre," 1927.

Prof. A. Wallichs Dipl. Ing. Dabringhause, "Die Zerspanbarkeit und die Festigkeits-Eigenschaften bei Stahl und Stahlguss." Betrieb 1930.

Franz Rapatz, "Die Schnittleistung von Schnellarbeitsstählen verschiedener Zusammensetzung und von Hartmetallen," Stahl und Eisen 1938.

Ausschuss für Wirtschaft und Fertigung: Leaves No. 119 to 125.

Dr. Ing. Leyensetter, "Grundlagen und Prüfverfahren der Zerspanung." Jahrg. 1938.

Dempster Smith, Manchester and R. Poliakoff, Moskau, "Versuche mit Spiralbohren beim Arbeiten in Gusseisen und Stahl." Werkstatta-Technik 1911, pages 99, 104 and 155.

Dr. Ing. Kronenberg, "Wissenschaft und Praxis beim Bohren." Werkzeugmaschine 1929.

St. Patkay, "Bearbeitbarkeit, Bohrarbeit und Spiralbohrer," Werkstatts-Technik 1928/29.

O. W. Boston and C. J. Oxford, "Power required to drill cast iron and steel." Amer. Mach. Lond. Vol. 71.

O. W. Boston and C. J. Oxford, "Torque, thrust and power for drilling." *S.A.E. Journal*, Vol. 28 (1931).

Prof. Dr. Ing. G. Schlesinger, "Kräfteberechnung bei Spiralbohrern und Spiralsenkern." Werkstatts-Technik 1932.

Wallichs-Beutel-Mendelsohn, "Zerspanungsuntersuchungen mit Spiralbohrern." *Berichte über betriebsgenossenschaftliche Arbeiten* 1932, Vol. 8.

Dr. Ing. H. J. Stoewer, "Entwicklung des Bohrmaschinenbaues und der Bohrerei Maschinenbau Betrieb 1933.

Ober Ing. H. Huth, "Wirtschaftliches Bohren, Werkstatt und Betrieb," 1940.

Salomon, "Zur Theorie des Fräsvorganges." Zeitschr. d. Vereins deutscher Ingenieure 1928.

Prof. Dr. Ing. G. Schlesinger, "Berechnungsgrundlagen zur Ermittlung des Leistungsbedarfes bei Walzenfräsern." Werkstatts-Technik 1931.

H. H. Klein, "Wahl des Vorschubes beim Fräsen." Werkstatts-Technik 1937.

P. Zieting and E. Brödner, "Der Fräser, Werkstattbücher," Book 22.

Dr. Ing. H. Kiekebusch and Dipl. Ing. F. Pohl, "Kräfte und Kräfteschwankungen beim Fräsen mit Walzenfräsern." Maschinenbau/Betrieb 1935.

R. Stock, "Fräserhandbuch" 1940.

R E F A Book no. 2, Frasen, 1940.

Dr. Ing. H. J. Schröder, "Werkstattregeln für wirtschaftliche Schruppfräsen." Werkstatts-Technik und Werksleiter 1941.

Dr. Ing. E. von Burg, "Drehzerspanungsuntsuchungen an Aluminium und Aluminiumlegierungen Schweiz." Arch. 1944, Book 6.

In addition to the source material listed above by Dr. Kuhn, the following articles represent studies made in recent years on related subjects and may be of interest to the reader:

The Editors

Dr. Ing. Kronenberg, "The inclination of the cutting edge and its relation to chip curling," *The Tool Engineer*, March 1945.

J. F. Allen, "Exploring carbide possibilities in single point turning," *The Tool Engineer*, September 1946.

Prof. Dr. Ing. G. Schlesinger, "Machinability of metals," *The Tool Engineer*, January 1947.

John G. Floden, "The effect of cutting fluids on drilling thrust and torque," *The Tool Engineer*, December 1947.

By F. W. Myers, Jr.

34—51180

Nomenclature and Applications of Welding Electrodes

The why and how of selecting welding rods for various applications

THE NOMENCLATURE of the metal rod used for arc welding is not yet universally accepted and used by operating and supervisory personnel in the metal working industries. According to the American Welding Society's 1945 edition of the *Inspection Handbook for Manual Arc Welding*, however, the following definitions (which will be used throughout this discussion so that a common interpretation will be given to all terms and expressions) are given as standard:

Welding Rod: Filler metal, in wire or rod form, used in those arc welding processes wherein the electrode does not furnish the deposited metal.

Electrode: a. Metal Arc: Filler metal in the form of a wire or rod, bare or covered, through which current is conducted between the electrode holder and the arc.

b. Carbon Arc: A carbon or graphite rod through which current is conducted between the electrode holder and the arc.

c. Atomic Hydrogen: One of two tungsten rods between the points of which the arc is maintined.

Bare (Lightly) Coated Electrode: A solid metal electrode with no coating other than that incidental to the manufacture of the electrode, or with a light coating.

Covered (Shielded Arc) Electrode: A metal electrode with a relatively thick covering material serving the dual purpose of stabilizing the arc and improving the properties of the weld metal.

Composite Electrode: An electrode, with or without a flux, having more than one filler material combined mechanically.

Requirements of Welding Materials

While comparatively few purchasing or other procurement agents may be in a position to compare the various types of welding materials on the basis of their own experience, it is essential that the welding engineer or supervisor be acquainted with sufficient data to enable him to make an intelligent analysis of qualities and to choose the type of electrode or rod best suited to the base material to be welded.

Wire should be handled carefully, so that the surface is not damaged or attacked by rust during transit or storage. Manufacturers frequently cover the wires with an anti-corrosive coating, which is not objectionable provided it does not affect the ultimate properties of the electrode.

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The coating is designed to cover the core wire in an even and uniform layer, and to adhere solidly to the core surface. It should be resistant to outer influences when the electrodes are subjected to long periods of storage and should not flake off or crack when used under average working conditions.

As a rule, electrode coatings contain substances which stabilize the arc, generate a slag, and contain binding agents such as sodium silicate. In some types of electrodes, alloying constituents are contained in the coating. See Fig. 1 for example of arc action.

Identification of Welding Electrodes

Correct understanding of the AWS standard numbering nomenclature is necessary to interpret the various letters and numbers used in the designation of welding electrodes. The key to this system, for iron and steel arc welding electrodes, follows: E=Electric arc welding; first two digits=Tensile strength (stress relieved); third digit=Position capabilities; fourth digit=Power supply, quality, type of arc, penetration.

Knowing the correct interpretation, it is relatively easy to use the AWS classification system. For example, an E6010 electrode class would denote the following characteristics:

a. Minimum tensile strength (stress relieved) of 60,000 psi.
b. Electrode is of the all-position type.
c. Primarily for use with DC current, reverse polarity.

E6011 is similar to E6010, but primarily intended for use with AC current. E6012 has less penetration than E6010, while E6013 is its AC-current counterpart. An electrode E6020 is limited for use to horizontal flat fillets, while E6030 is suitable only for downhand welds (flat fillets).

In the case of corrosion resisting chromium and chromium-nickel steel welding electrodes, the first three digits indicate the composition of the electrode while the last two indicate its usable positions and current. For the key to this classification, see *AWS Specification A 5.4 - 46 T.*

In addition to the above, a color system of distinguishing various types of electrodes, established by the National Electrical Manufacturers Association and approved by AWS, is generally accepted by the industry as the standard means of identification by visual inspection.

Types of Welding Electrodes

Bare electrodes, which are seldom used except for special applications, lose a considerable percentage of their constituents during transfer across the arc stream. In ordinary low carbon electrodes, for mild steel welding, the main constituents are carbon and manganese. There is, however, considerable nitrogen and oxygen pick-up during the transfer of the molten metal across the arc stream, resulting in a finished weld with less carbon and manganese than was originally present in the electrode. That is, the weldment will have different metallurgical properties than would be expected from an electrode with known original properties.

The above remarks also apply to the lightly coated electrodes, with the exception that, to a certain extent, the constituents in the coating neutralize the effects of the absorbed oxygen and nitrogen and produce a stabilizing influ-

ence on the arc. In addition, the constituent elements of the core rod are not burned off as much as in the bare electrode. Thus the welds made with lightly coated electrodes may be expected to have a slightly higher tensile strength and elongation.

Composition of Welding Electrodes

The various constituents of an electrode, in the core wire or the coating, have considerable effect not only on its operating characteristics, but also on its physical and chemical properties. The primary difference is usually found in carbon content, as well as in the kind and proportion of such alloying constituents as manganese, silicon, nickel, titanium, molybdenum, vanadium and chromium.

In the case of ordinary low carbon electrodes, the increase of tensile strength is proportionate to the increase of carbon content when other constituents are held constant. Since, however, a considerable percentage of the carbon is burnt off in the arc, it would not be safe to draw a conclusion as to carbon content of a weld solely on the basis of carbon content in the electrode core. The amount of burn-off depends largely upon the type of the electrode although, in general, it can be assumed that the loss of carbon content is approximately 75% in ordinary bare electrodes, and up to 50% in heavily coated types.

Manganese, in small quantities up to 0.5%, is primarily used for de-oxidation. Increased percentage, in the weld deposit, lowers its critical temperature and increases its toughness. In bare electrodes, it can be assumed that approximately 25% reaches the base metal through the arc while, in the heavily coated types, the coating contains so much ferro-manganese that the completed weld has a loss of only about 10 to 20%.

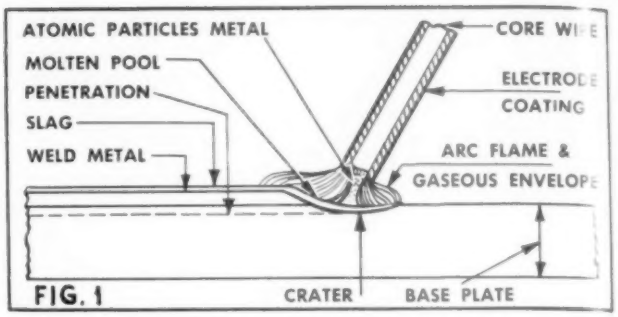


FIG. 1

Coatings stabilize the arc and also contain alloying elements.

Silicon, used in conjunction with manganese, increases the elasticity, strength, and toughness of the weld. It also acts as a scavenger, removing gases and creating a sounder weld. When used in bare electrodes, however, it burns up almost entirely in the arc; thus, any addition of silicon in bare electrodes would have no advantageous results, and would result in slag inclusions, pock marks and other defects. Used in average percentages in heavily coated electrodes, however, silicon increases the elasticity of the weld without any appreciable arc loss.

Nickel considerably improves a weld by increasing the tensile strength, ductility, and wear resistance, while titanium—with other elements—produces very strong weldments due to its high de-oxidizing and de-nitrating power. These two qualities make it possible to obtain innocuous combinations and thus increase the ductility and tensile strength of the weld.

Molybdenum and vanadium are also used as alloying elements to increase elasticity, hardness, and wear resistance; however, the use of both elements is confined usually to heavily coated electrodes. Chromium, used for its corrosion-resistant qualities, also increases the toughness and hardness of the weld. However, chromium is readily oxidized during transfer and its effectiveness is governed largely by the stabilizing qualities of the mineral coating.

Composition of Material

The chemical composition of a weld depends on the constituents of the electrode and also on those of the material to be welded. For a short period of time, certain areas of the base material, together with the filler metal, enter into a common pool of fluid molten metal, thus providing opportunity for the electrode metal and the base metal to combine into a homogeneous mass.

ASTM Specification Number	Specification Title Material	Class Electrode Generally Used
A7-42	Steel for Bridges and Buildings (Carbon Steel)	E60xx
A27-44	Carbon Steel Castings for Misc. Use	E60xx
A30-44	Boiler & Firebox Steel for Locomotives	E60xx
A53-44	Welded & Seamless Steel Pipe	E60xx
A70-44	Carbon Steel Plates for Stationary Boilers and Other Pressure Vessels	E60xx
A78-43	Low Tensile Strength Carbon Steel Plates of Structural Quality for Welding	E60xx
A87-44	Carbon Steel & Alloy Castings for RR	E60xx
A107-42	Commercial Quality Hot Rolled Bar Steel	E60xx
A120-44	Black & Hot Dipped Zinc-Coated (Galv.) Welded and Seamless Pipe for Ordinary Use	E60xx
A131-39	Structural Steel for Ships	E60xx
A148-44	Alloy Steel Castings for Structural Purposes	Chrome-Moly
A161-44	Seamless Low Carbon & Carbon Moly Steel Tubes for Refining Service	Carbon-Moly
A167-44	Corrosion Resistant Cr-Ni Steel Plate, Sheet and Strip	Stainless
A210-44	Medium Carbon Seamless Steel Boiler and Superheater Tubes	E60xx
A240-44	Corrosion Resisting (Cr and Cr-Ni) Steel Plate for Fusion Welding Unfired Pressure Vessels	Stainless
A240-42	Low Alloy Structural Steel	E60xx

If the carbon content exceeds 0.25% in plain carbon steel or 12% in low alloy steels, the parts generally require preheating. If HTS type electrodes are used, preheating may not be necessary.

The table at left indicates the correct type of electrode (wire or rod) to be used with various classes of steel.

For example, if the filler metal percentages in carbon and manganese content are higher than those of the base plates, the finished weld would be rich in these elements with a consequent increase in physical strength. On the other hand, if the base metal percentages in carbon and manganese content are higher than those of the filler metal, the finished weld may be richer in those elements than the filler metal but not necessarily as rich as the base plates.

Electrode Operating Characteristics

It is not easy to arrive at an exact distinction of electrodes on the basis of their operating characteristics. Only practical tests will enable a welding engineer to obtain a complete picture of these properties. Incidental factors, as well as the ever present human element, have considerable effect on electrode operation and tests.

Position capabilities. For welding in the vertical or overhead position, one requires an electrode with good adhering properties—a quality not possessed by all welding electrodes. A quick method of ascertaining the qualities of an electrode, in this respect, is to deposit a circular bead approximately 2″ to 4″ dia. on a plate set up in the vertical position. All the degrees of a vertical weld being simulated, it will be relatively easy to ascertain whether the electrode deposits best in the vertical or downhand position, or equally well in all positions. The electrodes which prove suitable for a weld of this type should also be quite satisfactory for overhead welding.

Another simple test, for electrode position operation, is to make 3/16″ and 1/4″ vertical fillet welds on a 1/4″ plate. The finished weld should have no evidence of undercut on either leg of the joint, and the root of the weld, when broken, should show corner penetration and be free from slag inclusions and porosity. See Fig. 2.

Penetration. If the proper electrode is selected for a specific requirement, the molten pool of the weld metal should not only adhere to the base materials but should also effect proper fusion. A good weld must show satisfactory penetration—that is, the weld bead deposit should extend to a certain depth beyond the surface of the base plates.

General Factors Affecting the Weld

Because of various factors, it is usually quite difficult to determine the penetration characteristics of an electrode; therefore, comparative welding tests must be carried out under identical conditions. One method consists of making a test fillet weld, which is carefully inspected to determine if the root of the weld shows full penetration and is free from slag inclusions. See Fig. 3. Another method is to run single beads on a flat plate under similar conditions. The plate is then sectioned and the depth of penetration measured. See Fig. 4.

Penetration will depend on current power as well as on arc length and the type of electrode used. Fig. 5 illustrates the penetration of a 3/16″ dia. electrode using different current values. The first bead shows a weld made with insufficient current, the second shows extremely high current with excessive penetration, while the third bead, made with the proper current values, results in proper penetration and appearance.

The properties of a weld depend not only on the type of electrode used but, among other factors, on the correct technique of slag formation, length of arc, and skillful manipulation of the electrode. Because of the various factors, an unskilled operator would probably not obtain the best results even if he used the most suitable electrode.

There is also a difference between the properties of the molten and transferred electrode material, those of the base plates, and those of the completed weldment. Due to the various factors present, the weld undergoes certain changes in micro-structure, such as composition of the base plates, the angle of bevel, and the procedure used in depositing the beads. An example is the multi-pass weld shown in Fig. 6.

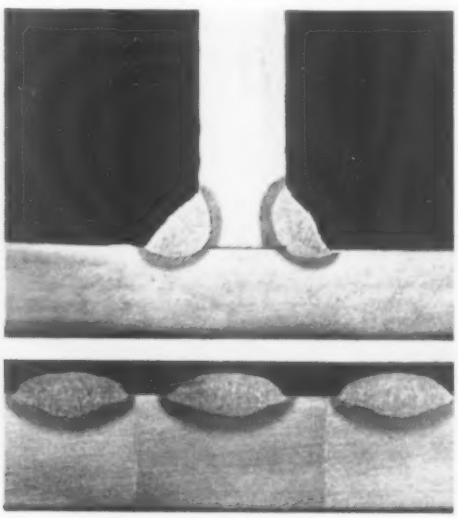
Magnetic arc blow. In electric arc welding, the operator is frequently confronted with the problem of magnetic arc blow, a phenomenon in which the arc dances and flickers in an unpredictable manner. This causes globules of molten metal to be deposited on either side of the weld groove, resulting in a very poor weld bead. This action of the arc is is due to the forces emanating from magnetic fields, and is more intense when DC current is used.

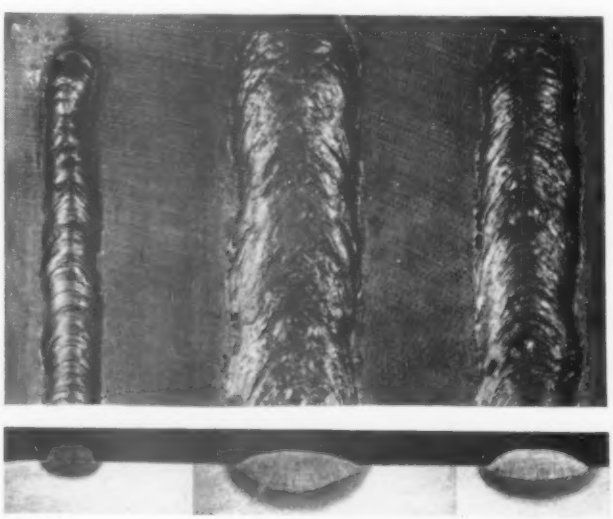
The way in which the current is conducted through the base plate to the arc has a decided effect on the arc flow. This phenomenon is illustrated in Fig. 7, showing the distribution of the lines of force. These lines surround the path of the current and run in vertical planes around the base metal.

It will be noted that the lines of force run in horizontal planes around the electrode and the arc. At the point where the arc touches the base plate, the lines jump to the vertical position, accumulating the lines of force at point "A" and causing the arc to be driven away from the contact point of the arc and base plate.

If the base plate is grounded from both ends, and an equal flow of current results, the arc blow will be suppressed to a certain extent owing to magnetic fields of equal strength being generated and balancing each other, as is shown by

Fig. 2, at left, shows vertical test fillet weld. Fig. 3, top center, test fillet weld to determine penetration. Fig. 4, bottom center, single beads on a flat plate to determine penetration. Fig. 5, at right, shows penetration with 3/16″ rod using different current values. The section at bottom shows poor, excess and good welds, reading from left to right.





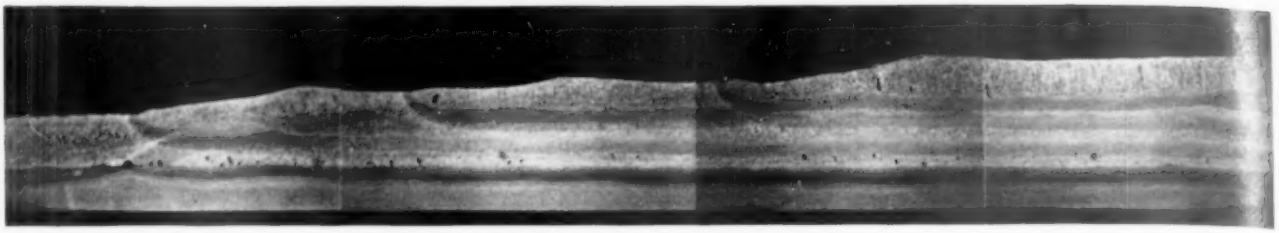


Fig. 6. Example of multi-pass weld.

Fig. 8. In addition, smooth action of the arc can be effected by the angle in which the welding electrode is held.

If the position is similar to that shown by Fig 9, an accumulation of force lines results on one side of the arc at point "A", so that the arc is driven in the direction of the arrow. That is, that when held at a certain angle, the electrode has a tendency to blow in the direction toward which it points, as illustrated by Figs. 10 and 11.

When the adverse effects of the current connection and the position of the welding electrode are eliminated, the arc may still have a tendency to blow back in the direction of the deposited bead. In explaining this, it is necessary that the reader keep in mind that the metal of the molten pool, and the base metal immediately adjacent, is non-magnetic. Therefore, the lines of force will generally avoid the non-magnetic material and run along the colder zone surrounding the molten mass. The arc is not directly in the molten pool but slightly ahead of it during the welding operation.

In the fillet and butt welds, the section ahead of the arc is not welded, leaving an air gap which must be bridged by the lines of force. At this point, the force lines are sent into the air, accumulate ahead of the arc and, being prevented from closing together immediately behind it, take the longer path of least resistance through the colder parts of the metal.

The arc is therefore driven back in the direction of the molten pool, with the arc blow increasing as the welding speed increases. The arc blow will usually be particularly intense while the first bead is being deposited, due to the considerable air gap ahead, then, as the following beads are made, the arc blow will be reduced because of the gap being partially bridged.

When the welding electrode approaches the end of the joint, a smaller area remains for the lines of force to be distributed through, so that their density increases when bridging the air gap. This may result in an intensified arc blow.

In ordinary manual arc welding, changing the angle of the electrode to various positions will generally suffice to hold arc blow to a minimum. If this method is not satisfactory, splitting the ground leads, or changing their position relative to the arc, will correct the condition in some instances. In addition to the above, an external magnetic field may be set up by designing a magnetic coil that can be placed around the electrode holder or the weldment. This measure will be necessary only in special applications.

Selection of Welding Electrodes

The proper selection of welding electrodes is essential to the production of good quality welds at reasonable cost. At present, numerous types of electrodes are available, each with its individual outstanding features. Some engineers recommend the selection of an electrode that will be applicable to the greatest number of welding jobs, while others recommend a variety offering selection for specific welding operations: in any case, the electrode selected should be chosen with care and caution.

For general guidance in selecting a suitable electrode for a particular job, the following main points should be considered: (1) The material of the base plates to be welded; (2) the design and position of the welds; (3) the qualities of the weld the designer expects to obtain; and (4) the welding properties of the electrode and the price.

As a starting point, the welding engineer or supervisor should determine what base material is going to be used—as, for example, special heat treated steels, boiler plate, or ship building plate. He should then consider the possible working loads to which the weldment will be subjected. Particular attention should be given to whether the load is static or dynamic, and whether the weldment will be subjected to a post-weld heat treatment and, possibly, subjected to fatigue stresses or corrosion.

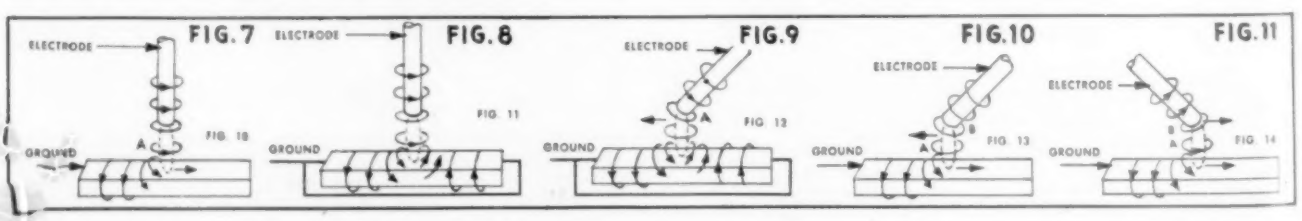
In addition, the welding engineer or supervisor should determine whether special codes or specifications govern the choice of electrodes for the proposed welding operation. When all of the above factors have been carefully considered, the number of type of electrodes that can be properly used will, in all probability, be greatly reduced.

It should be kept in mind that the type of coating greatly affects the finished weld deposit. If the work is not a special application, an electrode of the E6010-11 or E6012-13 class may be the most practical choice in most cases. These electrodes can usually be used for all position work—horizontal, vertical, and overhead—and offer satisfactory penetration among other desired physical properties. The heavily coated electrodes of the E6020 class are most appropriate for welding heavy material in flat and horizontal positions.

Finally, the cost of the various electrodes applicable for the job in question should be considered, and it should be borne in mind that a relatively expensive electrode with good welding properties will, in the end, prove more economical than a cheap electrode of inferior quality. Increased weld output must be taken into consideration, as, for example, the higher welding speeds obtained with large size electrodes. In many cases, the reduced labor cost will more than compensate for the additional expense of high quality electrodes.

General Cost Data

The type of electrode used on a given type of base material is, naturally, a very important consideration in calculating the cost of a welding operation. The calculations required to obtain the total cost of a weld will not be dealt with in detail, due to the many variables involved as, for example, differing labor costs and equipment; rather, only the various cost factors affected by the type of electrode used will be considered.



Spatter and burn-off losses. A certain portion of the weight of the welding electrode is lost during the welding operation through spatter and burn-off. To obtain exact comparative data, the quantity of deposited, as well as burnt-off, filler metal must be considered. The cost of the deposited weld metal is calculated on the basis of the price of the electrodes and the quantity consumed, after deduction of spatter and burn-off losses. These losses vary according to the type of electrode and are affected to a considerable degree by the type of current used.

The burn-off and spatter losses with bare electrodes, when used with normal currents, are approximately 8 to 14 percent. Considering that the price of bare electrodes represents an insignificant amount when compared with other factors, the differences in bare electrodes in burn-off and spatter loss are of practically no importance. Naturally, it is advisable to use that electrode which produces the least spatter and burn-off loss. The same considerations as those of bare electrodes hold true, in general, for lightly coated types.

It can be assumed that, with the heavily coated types, both the core wire and the coating suffer burn-off and spatter losses. The loss in the core wire and coating will approximate 10 to 40 percent. The coating material is basically for slag forming and therefore does not appreciably build up the weld size, except in the case of special electrodes with a certain percentage of alloying elements in the coating. It must be realized that the losses sustained will vary considerably, dependent upon the type of electrode used and many other factors, such as operator experience and excessively high welding currents.

An additional loss, to be considered, is the unused portion of the electrode which is held in the electrode holder.

Welding speed. Considering the over-all cost of making a finished weld, the wages paid the welding operator are an extremely important factor. The cost of the weld will naturally be less if the time required to produce the weld can be reduced. If all other conditions are equal, an electrode that can be subjected to high current and with the best deposition rate should generally be considered the most economical and advantageous for general welding operations where a high speed electrode can be used.

Prices of Welding Electrodes

The prices of welding electrodes vary according to fluctuations in the cost of basic materials. Generally speaking, the cost is also dependent on the type and grades. Quotations are generally given for 50-lb. boxes, although price reductions are usually granted when material is purchased in large quantities.

The fact that electrode length is not constant is also a cost factor to be taken into consideration. Coated electrodes of the $\frac{1}{8}$"–$\frac{5}{32}$"–$\frac{3}{16}$" dia. sizes usually come in standard lengths of 14", while those of $\frac{1}{4}$"–$\frac{5}{16}$"–$\frac{3}{8}$" dia. usually come in 18" lengths.

Summary

Many of the problems, in the proper classification of electrodes, have been cleared up to a great extent by the combined efforts of various technical societies and interested agencies. These groups have prepared specifications that cover the most common electrodes in use today .

Continuous research and development of electrode coating materials, by welding electrode manufacturers, is undoubtedly the most significant factor in the widespread use and acceptance of metal arc welding by the various steel industries. As is well known, one of the primary reasons for the development of shielded arc electrodes was to make possible the deposition of weld metal with physical properties similar to those of the base materials being welded. With the bare and lightly coated types, this was generally impossible.

Electrode development has progressed to the point where it is now possible to procure various types ranging from ordinary mild steel classes thru extremely high strength types, with other types procurable for welding non-ferrous materials which, previously, were considered impossible to weld successfully.

When selection of an electrode is made, the following considerations should be kept in mind: (1) Does the electrode have good operating characteristics? (2) Can it be used with AC or DC welding current? (3) Will the weld bead deposited have the required physical properties and meet various specification requirements? (4) Will the electrode be suitable for the different positions which may be encountered? (5) Is the cost of the particular electrode excessively high for economical production?

If careful and proper attention is given to the selection of a welding electrode, and the electrode is used according to the manufacturers' recommendations, excellent results will be consistently obtained in welded fabrication.

Bibliography

ASTM Standards, Part 1 on Metals
AWS Welding Handbook
AWS Inspection Handbook—Metal Arc Welding
AWS Electrode Specification—Mild Steel
Electric Arc Welding—Meller
Welding Metallurgy—Henry & Claussen

War-Time Quality Control Methods Fight Postwar Inflation

SCIENTIFIC METHODS OF PRODUCTION quality control, widely applied to integrate all-out production of prime and subcontractors during the war, can be one of industry's most effective weapons in the fight against inflation, according to Jerome R. Steen, Director of Quality Control, Sylvania Electric Products Inc.

Extension of the basic wartime method tends to improve quality and lessen scrap reduction of work lots all along the production line. An important factor is the extension of statistical methods and principles of the maximum number of manufacturing processes in order to cut costs, improve quality, and increase production.

The older methods of inspecting defects "out" of a part cannot assure quality in the postwar sense, since it does not build quality into every manufacturing step by checking the results of many processes. A greater application of the laws of probability, expressed precisely in mathematical terms, frequently reveals that specifications arbitrarily established require that quality characteristics be maintained within unnecessarily close limits, which tends toward needless wastage of labor and materials without increasing the true quality of the finished product.

With higher production costs due to increased direct labor and material costs, modern scientific quality control techniques help industrial production all along the line and particularly with the consumer who receives better average quality and therefore more for his dollar. In this way, Mr. Steen concluded, one of the most difficult inflationary trends, a combination of raised product costs and lowered product quality, may be effectively combatted.

Research Facilities for Industry

By L. J. Horn

APPARENTLY UNAWARE of facilities existing for research at moderate expense, many industrial concerns and engineers flounder through technical problems that could more expediently be solved at the engineering experiment stations of the Land Grant colleges or at endowed foundations. Concerned primarily with improving the industrial welfare of their respective states or areas, and operating on a nonprofit basis, these research institutions are now equipped to conduct large scale research in the major fields of engineering.

To a great extent, this expansion in postwar research services to industry has been made possible by the increased enrollments of students in the colleges with which the research institutions are linked. Such enrollments have provided the graduate students in engineering and the professional staff members so vitally needed to supervise the projects. In addition, improved physical facilities—such as laboratory equipment and scientific instruments—have been made available as a result of purchases from the War Assets Administration. The increased staffs, coupled with well-equipped laboratories, make possible a new and greater range in research objectives.

Major research problems are set up as regular experimental projects in the laboratories, and sponsors—industries, governmental bodies, technical societies or associations—contract on arrangements with the research institutions. The contracts usually cover such points as period of research, costs, terms of payment, patent rights, purchase and disposal of special equipment, and publication of research information.

The usual experimental projects are aimed toward improving the processes of an industry, utilizing waste materials as by-products, or developing new products and materials; however, projects for governmental bodies may deal with the general welfare, public health, or security of the citizens.

Many research institutions also offer a specialized technical service to industries, engineers, and others, thus providing solutions on technical problems which might not warrant being set up as regular experimental projects. Frequently, the occasion calls for a mere question and answer type of service, but there are also times when problems submitted require laboratory setups.

Some of the research institutions have access to good technical libraries and can offer engineers and industries, who themselves might be engaged in research, information on what has already been done in certain fields and thus save needless duplication in effort and expense.

Some industries find it convenient to train their personnel through short courses sponsored in cooperation with the research institutions. Such courses can be arranged for durations of a few days to several weeks, and training can be elementary or advanced. Specialists from industry usually supplement the research institutions' instructional staffs. Every effort is made to bring the enrollees of such short courses up to date on the latest developments in their fields.

Regardless of how great or small the problem be—i.e., whether a manufacturer desires use of a research laboratory, an inventor seeks information, or an employer wishes to provide a training course for his employees—the research institutions can usually offer assistance.

Fundamental Factors of Practical Die Design

By S. P. Karnitz

ABILITY OF A DESIGNER to determine, from the product part print, if the piece can be produced economically with inexpensive tools requiring a minimum of maintenance and repair, is a fundamental and important requirement in good die design. For this reason, he must accurately analyze all available facts and create a mental picture before starting actual design.

He must anticipate production and repair requirements; must study the type, thickness and characteristics of the material to be blanked, formed, drawn or forged. If the part is difficult or uneconomical to manufacture, Product Engineering must be consulted for permissible alterations in design or for changes in material specifications. An experienced die designer will not, ordinarily, start a drawing without asking himself the following questions to determine if his judgment is fundamentally sound:

1. Is the die required for low, medium or high production? 2. Can it be designed and built to produce the part economically to engineering specifications? 3. What construction is most desirable to keep repairs and maintenance costs at a minimum? 4. Can possible future minor engineering changes be economically incorporated? 5. Will it pass safety inspection? If these questions can be truthfully answered in the affirmative, the possibility for error is extremely remote.

While it is generally conceded that the best appearing design does not always reflect the best judgment, many tool engineers who consider themselves good practical die designers often create designs that are much too elaborate, and therefore too costly, for the number of pieces required. Of course, tool engineers are mass production minded, and all tools—except as used for experimental purposes—are designed and built to effect reduction in production costs. Consequently, there is rapid amortization.

However, all production is not mass production, and consideration must be given to small lot runs. In this connection, the more common mistakes—and the most frequent—on the part of die designers are: 1. Inability to properly evaluate construction cost, resulting in unnecessary expense and elaborate design. 2. Violation of basic mechanical principles. 3. Improper selection of tool steel for the application required. 4. Lack of understanding to visualize related proportioning of construction details.

An inexperienced die designer who shows resentment toward constructive criticism is more of a liability than an asset to an employer. However, a wise and experienced tool engineer will constantly endeavor to promote sincere and friendly cooperation with Product Engineering, the tool room, and supervising personnel.

Mr. S. P. Karnitz is Superintendent of Maintenance, Allis-Chalmers Manufacturing Company, LaPorte Works.

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

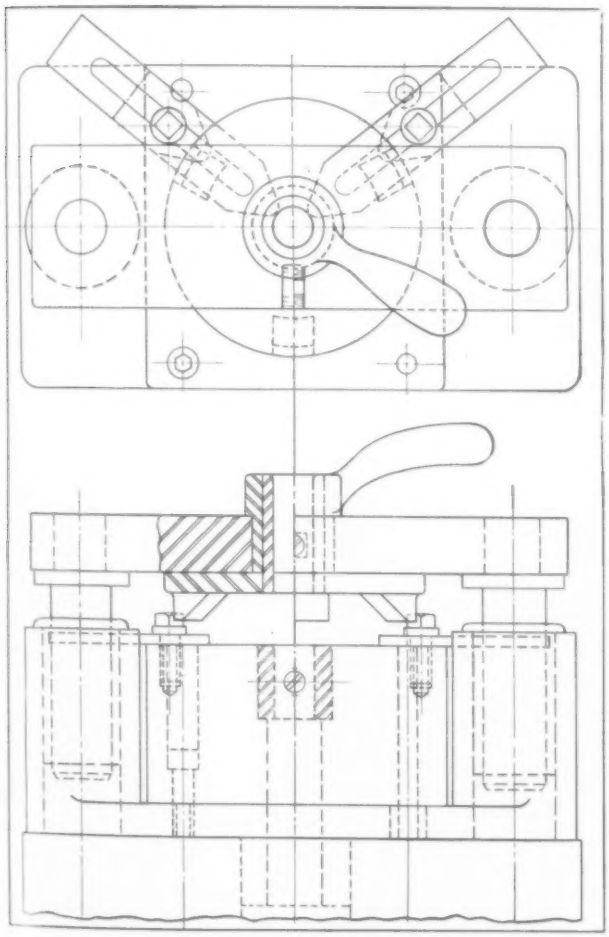
WHEN MACHINING PARTS similar in design but varying in size—as gears, for an example—the question arises whether to design holding fixtures for each size or a combination tool which can be used to machine all of the parts within their size range.

A manufacturer of textile machinery decided in favor of the latter type of tool, described below, for the drilling and reaming of gears of various sizes. This tool offers the following advantages:—lower initial as well as overall tool cost; less storage space required in the tool crib; and less time consumed in trips to and from the tool crib.

The gears range from 1" to 4" in outside diameter, and this variation is taken care of by two angularly located stops, made similar to slotted clamps, which may be adjusted to suit the O. D. of the gears. These serve for approximate locating when loading the fixture.

Attached to the bushing plate is one of several interchangeable 3-jaw locators which centers the gears with the bushing. These locators take several gears each—as from 1" to 1¼", 2¾" to 3", and so on through the range of sizes.

In this fixture for drilling and reaming holes in gears, adjustable fingers centralize the work which is further located concentrically with the bore by means of a 3-jaw locator in the bushing plate.



The work is not clamped; rather, the weight of the bushing plate holds them in place while the pointed ends of one or both of the two locators, entering the tooth space, take the torque of cutting.

The liner bushing is provided with a handle which also serves to lift the bushing plate the slight distance needed to clear the work when loading and unloading. However, slip-joint rods attached to the drill press quill can not only serve to lift the plate but, if provided with springs, can also serve to exert clamping pressure on the downward travel of the spindle.

Robert Mawson
Providence, R. I.

Screw Feed for Tailstock

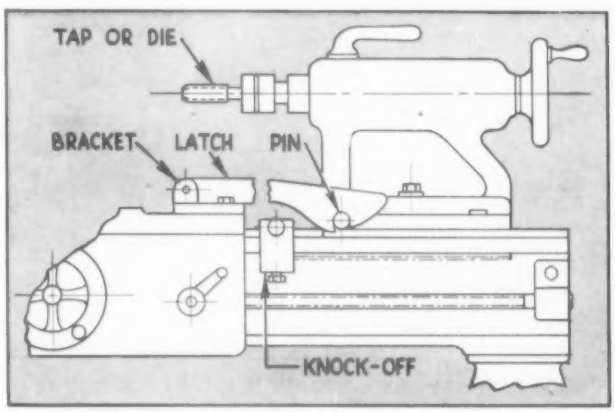
LEAD SCREW TAPPING, with the tailstock of a lathe, can be easily effected by means of a latch hooking on to a pin in the tailstock. The latch, which is hinged to a bracket mounted on the lathe carriage, rides over the pin as the carriage is hand traversed toward the tailstock and drops into place by gravity. The tailstock is left unclamped and moves forward with the carriage on hand traverse until the tap approaches the work, when the feed is thrown in.

The tap then advances to its predetermined depth until the cam rides up on a knock-off or trip dog, which arrests the feed and permits the tap to turn freely in a releasing holder. On hand traversing backward, the latch reengages the pin and permits the tap to withdraw through a reverse engagement in the holder—for that matter, a reversing tapping head can be used. The device can also be used with a collapsing or reversing die holder for external threading.

Since the latch can be thrown clear, so that it will not engage the pin, it does not interfere with normal lathe operations yet permits instant engagement for lead screw tapping with resultant cleaner threads and reduced tap breakage. Used with turret and tailstock turrets, the device converts an engine lathe into a power operated screw machine.

James Maltby
Garden City, Mich.

A latch, hooking over a pin in the tailstock, advances the latter in synchrony with the lead screw.



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Tool for Oil Grooving

A LARGE ORDER which called for oil grooves running continuously from the top of the flange and down along the I.D., on large powder metal bushings, presented an acute tooling problem. Production was high and the bushings varied in length and in the radii. Fortunately, outside diameters were alike; therefore, a simple indexing fixture, of welded construction, was designed and built.

This fixture—shown in cross section—consisted of an angular base, a "barrel" work holder, an index plate and two identical opposed cams, interchangeable in pairs. A guide pin in a hinged cutter head follows the cam path, with the cutter head further following a straight line down the cut by means of finished bosses sliding between the inside surfaces of the two cams. Drive to the cutter spindle, which runs at high speed, is through a train of mitre gears, all mounted in ball bearings. Cutters are commercial round nose end mills, gripped in a chuck.

Fixture and cutter head are mounted on a high-speed single spindle drill press. When loading and unloading, the head is raised clear of the fixture and guided by ways attached to the drill column; thus, the guide pin enters the cam path on the down travel of the spindle.

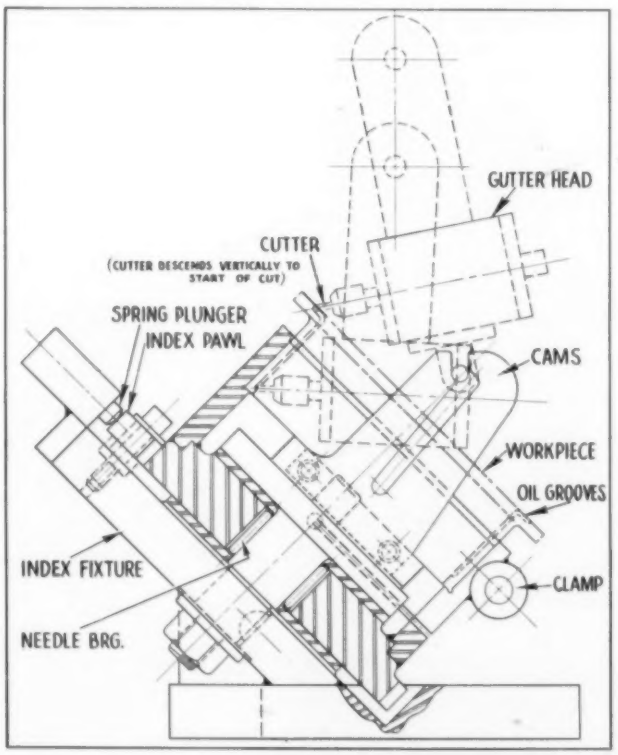
With the fixture inclined at a 45° angle, the cutter follows a descending path from start of cut to finish—i.e., the spindle travel is vertical while the cutter snakes its way from the flange and around the radius and then in a straight line the full length of the groove.

The cam shown presented the greater difficulty due to the sharp radius; however, a spring detent (not shown) held the guide pin tight against the back edge of the cam. The wider radii of the other bushings permitted easier cam paths without the sharp turn of the one shown.

It was expected that the pin would bear against the near side of the cam path on the return stroke, causing the cutter to cut deeper into the groove; therefore, provision had been made to back the fixture away from the work. Actually, the cutter swung away from the work by a few thousandths, so no trouble was encountered on that score. Floor to floor time per bushing was about one minute, four grooves being cut per bushing.

Jos. Satoski
Detroit, Michigan

FIG. 1. The guide pin in the cutter head follows the cam path until arrested at the bottom of the slot. Note that the cam path is at an angle to the center line of the workpiece. This is due to the fact that the angle of the cutter spindle changes progressively during its travel; however, it all reverts to straight-line motion once the cutter moves away from the flange of the workpiece



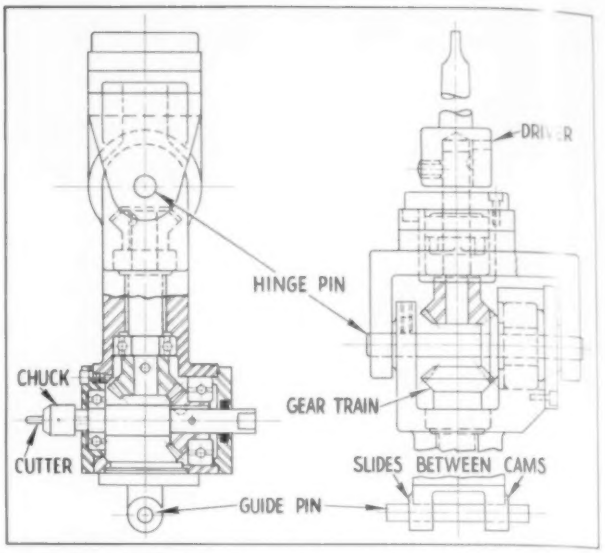


FIG. 2. The cutter head swings on a hinge and is guided by the travel of the guide pin down the slotted cam path. The finished bosses slide between the inside surfaces of the two cams

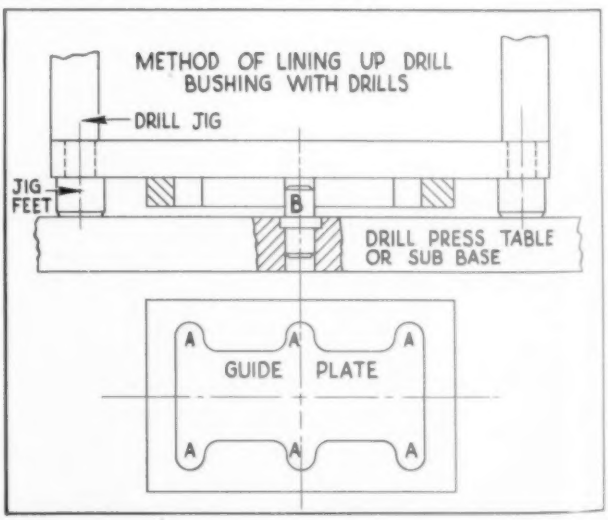
Locator for Drill Jig

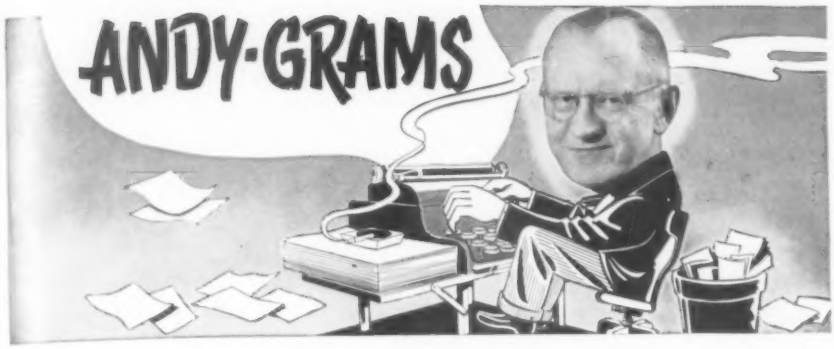
TO LINE UP THE DRILL BUSHINGS under the spindle while moving a jig from one hole to another, provide a guide plate which screws to the underside of the jig body. Then, press a pin into the drill press table, or into a sub-base which may be mounted on the table.

The guide plate shown is made for six holes, symmetrically spaced, and the openings "A" are jig bored to fit pin "B" and then cleared out for easy entry. Thus equipped, the jig can be moved rapidly from hole to hole, accurately aligning drills and bushings, with less drill breakage and longer tool life because drills will not dull as a result of striking the hardened bushings.

E. E. Woodman
Buffalo, N. Y.

A guide plate, attached to a drill jig and engaging a pin in the drill press table, will accurately align drill spindle with jig bushings





OF INTEREST TO SEVERAL THOUSAND of our members, many of whom—myself included—have taken a more or less active part in the doings, is the Swedish Pioneer Centennial, currently being celebrated throughout key cities in the Middle West and staged to commemorate the coming of the Swedish settlers to the Mississippi Valley some hundred years ago. Oh sure, they were here long before then, having trekked clear into Minnesota back in the Viking age. But that was before my time.

I got drawn into the picture two years ago when, as v-prex of the Swedish Engineers Society, Detroit, I was delegated to attend the initial meeting of the Pioneer Centennial Ass'n, held in Chicago. Then, early this year, I was elected chairman of the Detroit Committee at a convening meeting which included a number of ASTEers—John Markstrum, Gunnar Karlstrom, Charley Koebel, Carl Bjorklund, Herman Ortegren, Rudy Andreasson and Harry Gotberg—among most of the "Who's Whos" among my local landsmen.

Much as I appreciate the fine tribute, the fact remains that the Committee did the work and I sat back and took the plaudits. But then, life's like that. The remarkable thing about the entire affair was a complete absence of dissension, this despite that of the many groups represented—engineers, business and professional men and women, fraternal societies, and churches—the most were largely unknown to each other when the Committee was organized.

Well, we were going smoothly along when, like a bolt out of the blue, we got notice that the *Sofiaflickorna* (Sofia Girls, a team of girl gymnasts which has achieved international fame) were coming to Detroit and would we please arrange for an exhibition and housing for 20 women (the girls ranged from 16 to 24 years in age) and a trainer. That was the time I was glad to be prex of the Swedish Engineers Society, for I had only to call the Sheraton and reserve rooms, then my fellow Directors to get their okay, and the prex of the Ladies Auxiliary, S.E.S., to arrange for chaperonage, and there we were, all set for everything but a hall.

While I was mulling that problem, Arvid Lundell of Colonial Broach breezed in with Dean Smith of the American Turners, Detroit, with offer of the entire facilities of their fine clubrooms and gymnasium out Jefferson Avenue way. All this happened around Memorial Day. On Saturday evening, then, we welcomed the girls, who were in charge of Mrs. Herman Nelson of Rockford—and what an Ambassador of Good Will that lady turned out to be!—and, thanks to Nils Karlholm of the Sheraton, saw them properly feasted before saying good night.

Sunday morning, the girls attended services, then, in the afternoon, we took them out to Cranbrook where Carl Milles, world renowned sculptor is just putting the finishing touches to the exquisitely wrought fountain—the culmination of nine years' work—which is to be erected at Arlington cemetery.

Sunday night, the girls put on their show at the Turners, and that was an exhibition of rhythmic gymnastics the like of which you've never seen unless you saw the girls themselves. Boundless grace and dynamic action! Then to the Stockholm, where we "smörgåsborded" until sated and where the leader pinned a badge on me and thereby made me an honorary member. See what I mean about getting the glory?

Then, June 12, when we welcomed Prince Bertil and the Swedish delegation to Detroit. A reception at the Sheraton, another at a palatial home in Grosse Pointe, dinner at the Grosse Pointe Yacht Club, and everybody happy! Sunday A.M. the prince played golf with LeRoy Dahlberg, Les Colman of Fred. Colman & Sons, and Oscar Bard, prex of Michigan Tool, while I led a pilgrimage out to Cranbrook, where Carl Milles and Eliel Saarinen were hosts to the Delegation.

Then to the State Fair Grounds, where the Coliseum had been decorated in blue and gold and where some 5000 of my landsmen (supplemented by a sprinkling of Danes and Norwegians a/c there aren't that many Swedes in Detroit) heard the Pioneers lauded by representatives of State and City, Senator Johnson of Colorado, and Prince Bertil. A very impressive ceremony. That over with, an evening of *smörgåsbording*.

On Monday, the Prince and the entire Delegation were toured through Ford Motor Company and as many other plants as could be squeezed in between radio broadcasts and talks by various members of the Delegation at as many various places. I wasn't there, having gone in to work although I left early so as to get into my soup and fish before the banquet that evening. And that, without question, was one of the finest I've ever attended.

Dinner music was by a string quartette led by Esther A. V. Johnson, teacher of violin at Detroit Inst. of Musical Art and wife of an S.E.S. member; also, songs by Set Svanholm, a member of the Delegation and late of the Royal Opera, Stockholm, but now with the Metropolitan Opera; Betty Berg, a charming young soprano; and a male "Centennial" quartette led by Harry Gotberg. All *par excellence!*

We had arranged a dialogue between Messrs. Bertil Kugelberg, head of the Swedish Employers' Ass'n, and Nils Goude, head of the Swedish Federation of Labor, in which both parties brought out the advantages of each side dealing with a strong, unified organization. No knocking 'em over one at a time the way it's done over here. An agreement made, it's clear cut and inviolate for the duration.

Well, I've been telling you about Swedes, so I might as well devote the entire column to this theme, hoping that I can do as much for our Irish tool engineers should one of Tara's kings ever be reincarnated. One question asked me over and over again was: "What sort of a chap is Prince Bertil?" To that I can only say that he's all wool and a yard wide—a prince of a man and every inch a prince. Democratic, considerate and friendly, he has won the hearts of all who have had the pleasure of his company. And that goes for the entire Delegation, fine men and women who, almost without exception, have won renown in world affairs.

I asked them what their impressions were of America, and they said that the outstanding characteristic of the American people was their wonderful kindness, generosity and hospitality. Well, that's seeing ourselves in a nice light. I found out, however, that Sweden has given $6 billion to European relief, a lot of money for a land with only about 6 million population. A proportionate sum by our country would be about $140 billion. Not exactly hay, what? To my query as to what they wanted most over in Sweden the Delegation answered as with one voice: "Coffee!" Well, we gave 'em plenty of that and I guess there's enough left to send over a few pounds. So, if the several thousand of my landsmen among our ASTEers want to donate a pound or two I'll furnish the addresses. And now, skoal to the Pioneers, regardless of where they came from, who have worked to make America great!

ASTEely Yours,

Andy

Erection of A.S.T.E. Building Marks Milestone in Society Progress

BY NOVEMBER 1, the American Society of Tool Engineers will be established in its own, brand new home. This assurance was given Society officers and Directors by A. M. Sargent, Housing Chairman, during a special meeting when the Board voted an appropriation of $160,000 for site and construction of a headquarters building.

The meeting was called May 22 at Detroit to make a definite decision concerning the Society's housing problem.

In presenting the situation, Mr. Sargent reviewed his efforts to find larger quarters for the Society's operations, since his appointment in March, 1947, by then President W. B. Peirce, continued this year by President I. F. Holland.

Immediate requirements demand approximately 6000 square feet, with future needs estimated at from 10,000 to 12,000. The headquarters office force is now crowded into 3200 square feet. Additional space, Mr. Sargent declared, is not available in the present Penobscot Building location, and it is unlikely that a lease renewal for the inadequate suite could be effected at the same rate.

Other rental facilities have been considered and auctions, bankruptcies and liquidations involving real estate have been followed consistently.

Preparedness plans and increasing scarcity of building materials, he believes, make it necessary to build now or postpone the project for a number of years. Invited to express opinions on the feasibility of building immediately, L. P. Malone and John Thompson, local real estate agents, and Clyde Fulton, attorney, concurred with Mr. Sargent that new construction is preferable to remodeling.

Before unveiling building designs and plans which he had prepared and prior to showing sites for consideration, Housing Chairman Sargent asked the Board to act, appropriating funds for the project, or deferring it indefinitely.

A motion, "That we authorize the Building Committee and a Special Finance Committee, to be appointed, to proceed on the basis of $160,000 for new headquarters building and property, subject to the decision of the Board on location of lot and style of building," proposed by Mr. Peirce, of Pittsburgh, was affirmed by four more of the six Directors present. Participating in the voting were: I. F. Holland, of Hartford, presiding officer; H. L. Tigges, Toledo, 2nd Vice-President; C. V. Briner, Cleveland, G. S. Wilcox, Jr., Detroit, and H. E. Collins, Houston Chapter.

Since a previous action at the 1947 Semi-Annual Meeting required eight affirmative votes on a building proposal, absent Directors were contacted during the Detroit meeting. R. B. Douglas, 1st Vice-President, of Monteral, T. J. Donovan, Jr., Philadelphia, and K. L. Bues of Golden Gate Chapter, responded, adding their approval.

Several drawings of proposed buildings and corresponding floor plans were displayed and their relative merits discussed. In planning the projected building, Mr. Sargent was guided by experience gained in constructing his own factory, Pioneer Engineering & Mfg. Co.

After a luncheon recess, the entire group boarded a chartered bus for an inspection tour of selected sites. These included two on Second Boulevard—one on the fringe of the new Wayne University Cultural Center area and the other in an industrial section; three on Puritan Avenue west of James Couzens Highway in a Northwestern residential neighborhood; two on John R Street, in the Michigan State Fair race track vicinity; one on East Eight Mile Road, just beyond the city line, and another on Woodward Avenue near the McGregor Library. The last-named location is in the City of Highland Park, a community within Detroit proper.

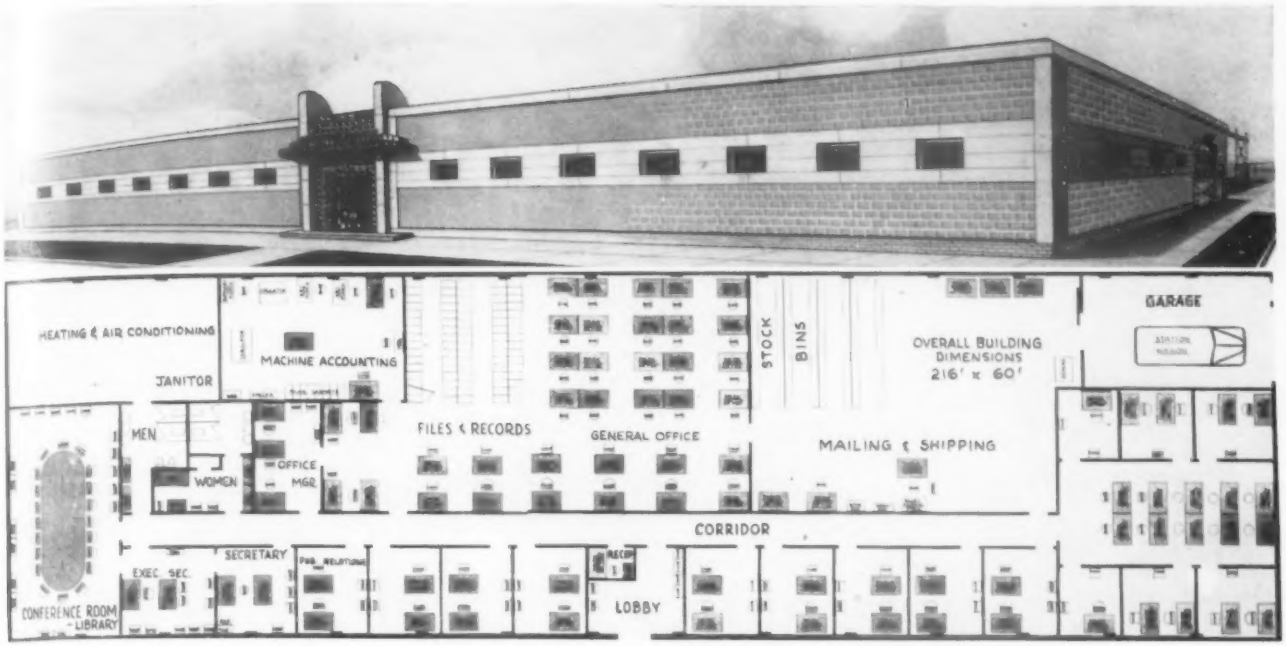
Back at the Fort Shelby Hotel, the Directors voted on their choice of sites in the order of preference. Two of the adjacent Puritan Avenue lots, situated about seven miles from downtown, were favored over all others, and it is one of these, a 224 x 100 foot tract, which has been acquired for the new ASTE Central Office.

In two more official actions, the Board indicated the type of building preferred and authorized defraying expenses of a Building Committee and Special Finance Committee from the building fund. At Mr. Sargent's request, they also selected detail building features for the Committee's guidance.

According to specifications designated, the one-story, grey-painted, cinder block structure will rest flush with the sidewalk on Montevista, Manor and Puritan Avenues, eliminating grounds maintenance. It will be entered from Puritan Avenue, through a revolving door set in a central glass block facade. The Society name in wood block letters will outline a marquee. Small stationary windows with sandstone trim, above furniture and eye level, are to be fitted on the inside with blackout shutters.

Interior of the cinder block walls will be painted. There will be few full parti-

When this photograph was made on June 22, the wooded, Puritan Avenue site of the new ASTE building provided cover for pheasants. In rear are garages forming part of the surrounding northwestern residential neigborhood



The Society's long anticipated permanent home will look like this, according to the rendering and tentative layout prepared by Housing Chairman A. M. Sargent

tions running to the 12-foot, acoustical-insulated ceiling, eight-foot movable partitions serving to separate most of the offices. Overhead general lighting of the fluorescent type will be controlled from one central switch, a saving in wiring costs. Hardware is reduced to a minimum. Inside doors will have push plates and pull handles, but no locks.

In a large, general office area, clerical workers and some committee activities will be accommodated. Smaller offices will be assigned to executives, their personnel, and other departments. There will be urgently needed, enlarged facilities for mailing and shipping, and more room for the machine accounting equipment.

Oil fired, hot air heating equipment, a hot water tank, a 30-ton ice capacity air conditioning plant, and janitor's quarters will take up one corner of the building. At the rear of the opposite end, the plan shows a garage for a station wagon to handle mail and pickups and to transport visitors.

A combination conference room-library, lobby, receptionist office, and tile washrooms complete the tentative layout.

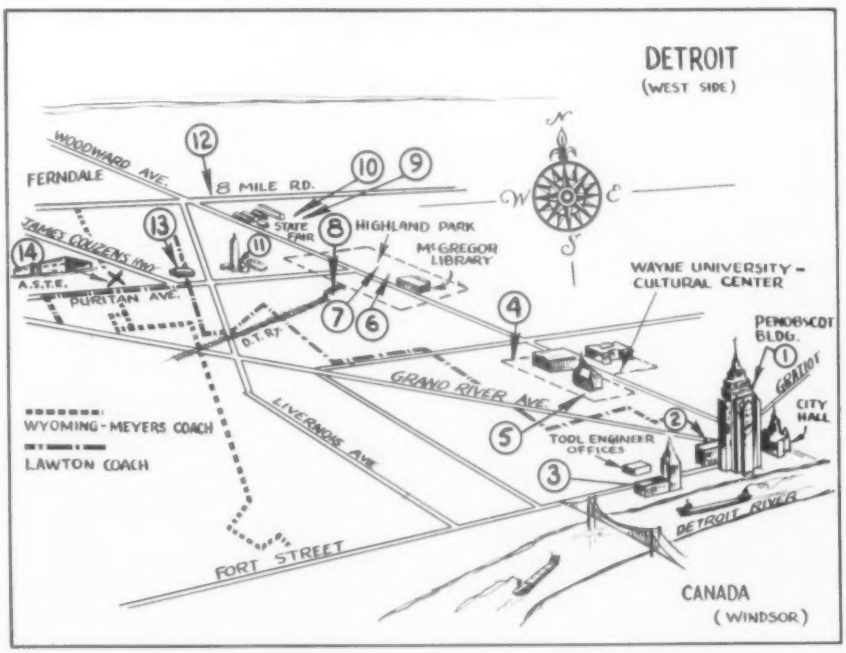
As planned, the building exceeds present needs, but contemplates expansion to include increased Standards Committee activities, continued Handbook Committee operations, possible employment of permanent exposition personnel, and ultimate absorption of *The Tool Engineer* staff. A 40-foot parking lot in the rear can be utilized for future additions to the 216 x 60-foot structure.

Present overhead is $3.16 per square foot for the 3200 square feet occupied in the Penobscot Building, or $2.40 taking into consideration space provided for *Tool Engineer* operations in the offices of Powers & Co., Inc., Publishers. Cost of maintaining the new building is estimated at $1.55 per square foot for approximately 12,000 square feet.

A. N. Hickson, Detroit builder, quoted a guaranteed figure of $101,993, exclusive of bond, for a building, constructed to Mr. Sargent's instructions, to be erected in not more than 120 days.

To direct the enterprise, President Holland appointed a Building Committee, composed of Mr. Sargent, Chairman, Mr. Peirce, Mr. Wilcox and H. E. Conrad, Executive Secretary; and a Finance Committee, headed by R. H. Morris of Hartford, Chairman of the former Building Fund Committee. On his Committee are: Mr. Tigges, Mr. Briner, G. A. Goodwin of Dayton, National Treasurer; Mr. Peirce and Mr. Sargent. This Committee meets July 10 to work out financing arrangements.

Others present at the May 22 meeting were: V. H. Ericson, of Worcester, 3rd Vice-President; W. B. McClellan, Detroit, National Secretary; J. J. Demuth, St. Louis, R. W. Ford, Pittsburgh, and H. J. Richards, Boston Chapter, Directors-Elect; Maxsine J. Erickson, Secretary to Mr. Conrad; and Doris B. Pratt, *ASTE News* Editor.



MAP LEGEND

1 Present ASTE Headquarters
2 Main Post Office
3 Union Station
Building Sites Considered
4 Second Avenue and Colburn
6 Woodward Avenue. City of Highland Park
8 Second Avenue, South of Detroit Terminal Ry.
9 John R Street between Lantz and State Fair
10 State Fair and John R Street
12 East Eight Mile Road, City of Ferndale
5 Site of new Engineering College, Wayne University
7 Site of new Auto Club building
11 University of Detroit
13 Marygrove College
14 Site of new ASTE building

TAKE THE GOLD RUSH TRAILS

By Doris B. Pratt

Old and New West Lures ASTE
To Los Angeles Convention
On Centennial of California Gold Discovery

FOR A HUNDRED years the gleam of gold has been an irresistible magnet, drawing treasure seekers westward. Early Argonauts sought the precious yellow metal washed down rugged mountains by rushing streams. Later travelers flocked to the "Golden State" for the magic of its sun flooded skies, valleys thick with groves of luscious oranges, and heady with the perfume of their blossoms, slopes splashed with bright poppies—California's state flower, and ocean depths teeming with yellowtail.

More recently the liquid "black gold" flowing from some of the world's richest petroleum fields, and Hollywood's tinsel glitter have enticed another surge of fortune hunters.

It was on January 24, 1848, that James W. Marshall, a New Jersey wheelwright, bent to examine a bit of shiny yellow substance while building a millrace. This

From top: From his granite shaft James Marshall, who set off the California gold rush, points toward the millrace at Coloma where he discovered the precious yellow metal. Sutter's Fort, part of John Sutter's extensive property on which Marshall made his historic find, is preserved at Sacramento. Arching gracefully across the Golden Gate at San Francisco, the bridge of the same name is the world's longest single span. Another rush, for "liquid gold," began in 1922 when the richest concentrated oil field in the world was discovered at Signal Hill near Los Angeles. The lunging waters of Sunset Falls fascinate these tired hikers resting in the golden sunshine of Washington State

fin[illegible] made at Coloma, some 50 miles w[illegible] of Sacramento, was to change the c[illegible]se of history in the West.

[illegible]e mill, owned by John Sutter, an e[illegible]rant who had come over the Oregon T[illegible] some 10 years earlier, was situated o[illegible]n an extensive land grant from the M[illegible]ican Government. In return for the t[illegible], Sutter built a stout fort, and set u[illegible] rudimentary factories and workshops.

Owner Lost All

He cultivated the land, added to his holdings and grew rich, before Marshall's gold find. Though the wealthy Sutter tried to keep the discovery secret, it leaked out and his property soon swarmed with greedy claim stakers. Death found him bankrupt, having lost title to his land.

But at Sacramento, Sutter's Fort still stands as a shrine to American initiative and a mecca for tourists.

This year when California is celebrating the "Gold Rush" Centennial, you can retrace the paths of the pioneers as you journey to and from the ASTE convention at Los Angeles, October 11-13.

And when you board that convention special at Chicago, you'll be observing another centennial. For it was in October of 1848 that a wood-burning locomotive pulled the first car out of that great railroad center, for a five-mile roundtrip at the dizzy speed of 15 miles an hour.

Return Another Way

Now your luxurious streamliner whisks you out to the coast in a matter of hours. While the west-bound ASTE train will follow the Old Santa Fe Trail, you may return independently by any of several optional routes.

One strikes east from San Francisco by way of Salt Lake City and Omaha, over the historic Overland Trail; another heads north through Oregon and Washington, then in the tracks of the old fur traders across Idaho, Montana and Minnesota; and a third goes southeast via Texas and New Orleans.

Each of the transcontinental runs offers such a wealth and variety of scenic beauty that it will be difficult to make a choice.

Take In National Parks

National parks are generously scattered around this western wonderland, and California has more of them than any other state. Yellowstone, Yosemite, Sequoia, Lassen Volcanic, Bryce Canyon, Crater Lake, Grand Canyon, Mt. Rainier, Glacier, Wind Cave, General Grant, Mesa Verde, Rocky Mountain, and The Badlands are all familiar names of public playgrounds you've yearned to visit.

Great engineering triumphs like Bonneville, Boulder, Grand Coulee and Mt. Shasta dams are awesome by their evidence of man's mastery over nature.

Deep blue lakes, forest grandeur, fruit and floral opulence, snow capped peaks and turbulent streams make Washington and Oregon unforgettable.

Of course, San Francisco is a must in any California itinerary. Wheezy cable cars laboring up and down hills more numerous than Rome's, graceful Golden Gate Bridge, colorful Fishermen's Wharf, ancient Chinatown, gay Bohemian cafes, smart shops and exotic foods are all symbolic of this gateway to the Orient, a truly cosmopolitan city.

Then you'll definitely want to allot extra days for gadding about the 450 square miles of assorted attractions that are Los Angeles and its satellite communities.

Your hosts in Los Angeles Chapter and the National Program Committee have planned a full schedule that will keep you busy going places, seeing, hearing and doing things throughout the three convention days.

So Much To Do

But you'll want to make some independent tours and of these there is no lack. Catalina Island alone offers a half-dozen different trips to see submarine gardens, flying fish, the Isthmus, Summit Drive, Skyline Drive and Bird Park. Then there are miles of smooth, warm beaches, sailing, surf riding, moonlight boat excursions and a water taxi tour of the harbor.

Movie premieres, previews, concerts under the stars, celebrity-packed cafes on swank Sunset Strip, racing at Santa Anita, golfing at mile-high Lake Arrowhead and tuna fishing off Newport-Balboa, are only a few of the amusements and sports available.

Fall's the opening of the desert season and there's an Old West celebration at Palm Springs, with a revival of rip-snorting Gold Rush Days, at Mojave. Other October events include a rodeo at Victorville, the Salton Sea Regatta, and the Wine and Harvest Festival at Delano.

Food With Atmosphere

Speaking of food, Knott's Berry Farm at Buena Park is the place for "southern fried's," spiked with boysenberries in various forms. You can easily spend a day rambling around this unique family-conducted institution which includes everything from an old time ghost town to a lakeside chapel with a dramatically-lighted painting of the Transfiguration.

Exploring old Spanish missions will give you an insight into California's historical background, and—but this gives you an idea of some of the things you'll be missing unless you're with us on that Los Angeles convention trip.

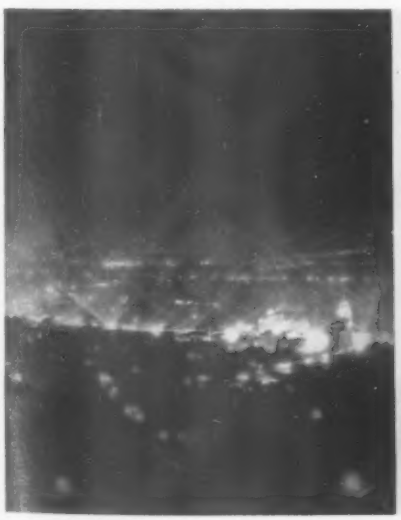
Next month we'll tell you more about it and all about the program, in an issue that will be largely devoted to the semi-annual meeting and Pacific Coast industry.

Help In Planning Your Trip

In the meantime, drop a line to Howard Windsor, Secretary to the National Program Committee, at the Society's Penobscot Building headquarters in Detroit, and let him know that you want to go along.

He'll put you in touch with travel experts to help you plan your itinerary and return route and arrange your reservations. (There's a post card for this purpose just inside the front cover of your May copy.)

Other gold hunters seek the glitter of Hollywood (shown here on premiere night), profitable orange groves in lush California valleys, and gleaming trout such as this fisherman is angling for at the base of Tumalo Falls near Bend, Oregon, in the Cascade Mountains. Photographs courtesy of Sacramento Chamber of Commerce, San Francisco Convention and Tourist Bureau, Los Angeles County Chamber of Commerce, Washington State Department of Conservation and Development and Oregon State Highway Commission



Canadian Engineers Solve Jet Tooling Problems

Windsor, Ont.—The story of how Canadian industry and ingenuity built Canada's first jet propulsion aircraft engine, was revealed for the first time in Windsor, May 10, in a talk before the local ASTE Chapter, by Winnett Boyd, Assistant Chief Engineer, Gas Turbine Div., A. V. Roe Canada, Ltd., Malton.

At the meeting, sponsored by Colonial Tool Co., Ltd., of Windsor, Mr. Boyd told over 200 members and guests that the "Chinook" had passed all tests. Weighing only 1410 pounds, it develops its 300 hp of thrust at a speed of 600 miles an hour. The engine is capable of taking a plane up to 56,000 feet.

Requiring no "warming up," the engine can lift a plane off the ground within 20 seconds after the starter button has been pressed.

Thrust is developed by the Chinook from its exhaust gases which leave the tail of the engine at 1200 miles an hour. These gases have a temperature of well over 1000° F. which, Mr. Boyd pointed out, gives an idea of the problems involved in building an engine to withstand such high temperatures.

A display, furnished by Colonial Broach Co., showed some of the intricate broaching operations performed by them on the blade slots in the compressor and turbine discs.

In tracing the development of gasoline and steam engines, the speaker observed that the gas turbine is particularly adapted to aircraft because of its relatively light weight and high operating efficiency at high altitudes.

Slides illustrated contemporary British, American and German jets. Mr. Boyd visited builders in the first two countries and studied their designs.

The large attendance and numerous questions asked gave ample evidence of the wide interest in the subject.

Sinks Formed from Sheet In Fraction of Minute

Richmond, Ind.—For their May meeting, members of Richmond Chapter were guests of the American Central-Division, Avco Manufacturing Corp. at Connersville.

Following dinner, a tour of the plant gave the visitors first-hand knowledge of how metal kitchen units are made.

Much interest was shown in the massive presses converting flat sheets of metal into kitchen sinks within a fraction of a minute. Equally attention-arresting was the manufacturing of cabinets, refrigerators, and Jeep bodies.

The porcelain enamel plant was also visited. Here refrigerators and sinks are given a glistening, white, acid-resisting coating, in one of the country's most modern factories.

Data Sheet Index Aids In Numbering Equipment

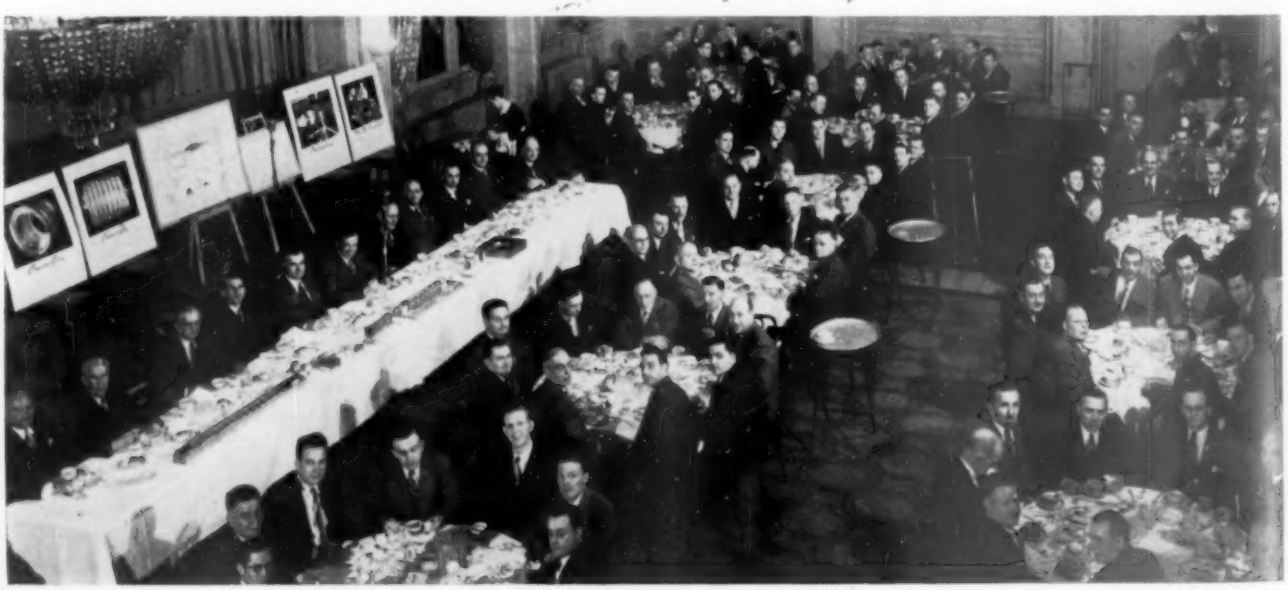
Detroit, Mich.—Supplemented with a government publication, the ASTE Numerical Data Sheet Index can serve a dual purpose, W. A. Thomas, Data Sheet Sub-Committee Chairman announces.

Catalogs, machines and tools can be assigned ASTE Index Numbers when the index is used in conjunction with the U. S. Standard Commodity Classification, Volumes I and II, according to Mr. Thomas. The set of two volumes is available for $2.50, from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Originally planned as a reference aid in locating material, the ASTE abridged index is an initial edition of what the Committee hopes to issue in expanded form as budget permits.

Other News In This Issue

The story of Canada's jet engine highlighted this dinner meeting of Windsor Chapter. At speakers' table, from left, are: John M. Van Loon, General Manager, Colonial Tool Co., Ltd.; Charles R. Staub, Chief Engineer, Michigan Tool Co.; Carl Lehr, Colonial Tool Co.; Albert Carley, Chrysler Corp., Canada; Harold Porter of Upton-James-Bradeen, and Chapter Chairman; Winnett Boyd, Assistant Chief Engineer, A. V. Roe, Canada, Ltd., technical speaker; "Hap" Hodgins, General Motors, Canada; Arthur Thomas, Ford Motor Co., Canada; William Tyson, Chrysler Corp.; L. B. Bellamy, ASTE National Standards Chairman; Reginald T. Richards, Ford Motor Co., Canada, and Past Chapter Chairman



"Better Member Service," Theme of Regional Meetings

GREATER COORDINATION and integration of Society activities, a better understanding of prescribed operating procedures and new approaches to Chapter problems are expected as a result of a series of Regional Meetings held during May and June at central points throughout the U. S. and in Canada.

North Texas Chapter's warm welcome to delegates attending the Southwestern Regional Meeting was accentuated by temperatures that rocketed to 102° during the hottest June 5 and 6 in the 50-year history of the Fort Worth Weather Bureau. Despite the discomfort of the first heat wave of the year, the visitors enjoyed the conference, many expressing themselves in favor of a similar meeting next year in Fort Worth or Dallas.

The weekend program began Saturday morning with a visit to the huge Consolidated Vultee Aircraft Corp. plant, home of the B-36, largest land bomber. ASTE member employees acted as guides for the conducted tour. Meanwhile, the ladies made the rounds of the shopping district.

In the afternoon the entire party attended the First Annual Southwestern Industrial Exposition, where manufactured products of five area states were displayed. A barbecue dinner at the "Big Apple" preceded a reception, dancing and refreshments at the Blackstone Hotel.

Sunday morning, representatives of Houston, New Orleans, Denver, Wichita, and St. Louis Chapters, and the host group met with national officials for a business session at the Blackstone.

John A. Lapham, Host Chapter Chairman, opened the meeting and introduced speakers' table dignitaries: H. L. Tigges of Toledo, 2nd Vice-Pres.; W. B. McClellan, Detroit, Natl. Secy.; H. E. Collins, Houston, Natl. Director; H. B. Osborn, Jr., Cleveland, Natl. Public Relations Chm.; W. G. Ehrhardt, St. Louis, Natl. Program Com.; and Chapter Chairman C. N. Hazlewood, New Orleans; B. J. Hazewinkel, Denver; D. F. Saurenman, Houston; and L. S. Icke, Wichita.

Mr. Tigges conducted the morning session and Mr. McClellan presided after the luncheon recess. Following delivery of National Committee reports, a general discussion developed.

The assembly concluded with an expression of appreciation to the national officers and an invitation for a meeting next year, possibly in February or April.

Attendance included: C. J. Helton, E. H. Malley, J. R. Matthew, and N. L. Koser, of Denver; D. E. Mackenzie, W. L. Clarke, J. D. Bailleres, H. R. Wilkins, H. J. Ritchey, Jr., J. P. and J. L. Salzer, Homer Briggs, Henry Lichte, L. M. Krausse, A. J. Rod, and L. L. Blake, Jr., of Houston.

E. L. Minch, A. E. Unruh, Fred Bates, Jr., R. O. Graham, T. A. Hersh, B. H. Andrews, R. E. Greding, J. N. Banks, P. D. Browne, Chris Hesse, H. D. Levy and N. M. Rosen of the local Chapter.

* * *

Eleven other Chapters convened May 23 at Hotel Gibson, Cincinnati, Ohio, for the South Central Regional Meeting.

Among opening speakers were G. A. Goodwin of Dayton, Natl. Treas., and presiding officer; I. F. Holland, Hartford, Pres.; Mr. Tigges, and H. E. Conrad, Detroit, Executive Secy.

Committee reports were presented and discussions conducted by H. E. Campbell, Cincinnati, Natl. Public Relations Com.; L. B. Bellamy, Detroit, Chm., and R. C. Peterson, Toledo, Natl. Standards Com.; and H. M. Windsor, Secy. to Natl. Program Com.

In the afternoon, a number of the delegates withdrew to participate in separate forums concerning Program, Standards, and Public Relations.

The remainder of the assembly continued with a discussion of other Society activities.

Others present included Prof. H. F. Owen, Indianapolis, Chm., and J. N. Edmondson, Columbus, Natl. Education Com.; O. E. Harvey, Detroit, Natl. Standards Com.; H. F. Volz, Natl. Membership Com.; and G. A. Irwin, J. B. Reichard and C. J. Postel, Akron.

G. H. Simon, Henry Bruewer, E. L. Rontzong, M. L. Weidig, Bertram Workum and W. J. Frederick, Cincinnati; A. W. Montague, W. K. Armagost, T. F. Starkey, G. M. Amstutz and W. E. L. Bock, Columbus.

J. H. Schron and G. A. Hier, Cleveland; J. A. Black, N. H. Booker and H. W. Davis, Louisville; E. J. Seifreat, Gordon Letsche, R. M. Blair, R. A. Armstrong, A. C. Good, Paul Snyder and George Tillotson, Dayton.

H. W. Curfman, R. F. Krause and G. R. Duncan, Indianapolis; Ralph McKee and P. C. Perrine, Richmond; W. J. Brown, C. L. Marker, A. F. Kurtz, C. P. Root, P. E. Grow and R. L. Waters, Muncie; L. F. Rothert, Toledo; R. L. Horstman and E. M. Neff, Springfield, Ohio.

* * *

Fifty officers and members of 13 Midwestern Chapters met May 9 at the Palmer House, Chicago, to discuss their common and individual problems and projects.

Representing the national Society

The Lone Star State seems to hold supremacy in Texas' and California's rivalry for superlatives—at least in the field of high temperatures, as demonstrated in these pictures. Top view shows Regional Meeting of California Chapters at Los Angeles. Below: Delegates from six Southwestern Chapters swelter in 102° weather at Fort Worth

were: President I. F. Holland, 2nd Vice-President H. L. Tigges, National Secretary W. B. McClellan, who chaired the meeting; Directors C. B. Cole of Chicago and G. S. Wilcox, Jr., Detroit; Standards Chairman L. B. Bellamy.

Finance Chairman G. C. Johnson, Rockford, Education Chairman H. F. Owen, Program 1st Vice-Chairman F. J. Schmitt, Chicago; and Executive Secretary H. E. Conrad, Public Relations Director J. M. Cannon, and Secretary to Standards Committee S. F. Girard, all of the Detroit office.

Chapter attendance included: Andrew Carnegie, G. T. Koch, M. O. Cox, C. G. Sharpe, O. E. Harvey, L. G. Kiefel and W. King, Detroit; C. E. Moran, W. E. Swan and M. G. Borneman, Racine.

J. J. Ebner, A. C. Gudert, H. G. Heimann, Waldemar Klein and R. A. Radtke, Milwaukee; A. J. Schwister, Frank Martindell, H. M. Taylor, T. C. Barber, W. R. Shrode, F. M. Kincaid, W. E. Burke, B. C. Brösheer, Dale Long, B. F. Kenyon and E. G. Noreen, Chicago.

H. A. Nelsen, G. H. Rigeman, H. G. Carlberg, Stanley Olson, E. C. Varnum, J. C. Wisner, and M. J. Bross, Rockford; H. M. Creasey, W. G. Callies and L. W. Greenblatt, St. Louis; H. N. Bristow and E. L. Schenk, Tri-Cities; Gordon Swardenski, Peoria; J. P. Schommer, E. J. Kaiser and N. R. Boynton, Fond du Lac.

M. F. Rose, Tri-State College Section, Fort Wayne; R. W. Cook and R. W. Bund, Flint; R. E. Bextine, and J. M. Speck, Cedar Rapids; R. F. Waindle, C. C. Moore and George Bodi, Fox River Valley.

* * *

The three California Chapters sent delegations to a similar session at the Biltmore Hotel in Los Angeles, May 1.

National Program Chairman E. W. Baumgardner officiated, assisted by his 1st Vice-Chairman, F. J. Schmitt, Director K. L. Bues of Golden Gate, and Secretary to Program Committee H. M. Windsor.

Coming from Golden Gate, the most distant Chapter, were: E. C. Holden, Basil Keys, L. P. Martin, Florindo Viti, E. J. Raves, J. V. Coulter, H. H. Hagedorn and A. L. Minetti.

The San Diego group consisted of: E. G. Gray and G. M. Carraway. B. J. Hazewinkel of Denver also was a visitor.

Present from the Host Chapter were: L. F. Hawes, Wayne Ewing, R. R. Linch, G. J. Walkey, H. S. Bamberger, C. L. Wight, Anton Peck, H. G. Groehn, A. D. Lewis, Rudolf Regen, and J. A. Parks.

* * *

Other Regional Meetings, held at Philadelphia, Pa., Toronto, Ont., Rochester, N. Y., Worcester, Mass., and Portland, Ore., were unreported at press time.

T. E. Course at U. of I.

Urbana, Ill.—Tool Engineering, production engineering, motion and time study, and production control are now being offered as part of a new Production Engineering "option' in the University of Illinois Mechanical Engineering department, Prof. N. A. Parker, department head, has announced.

New Administration Sworn in at Cedar Rapids

Taking the oath of office are, from left: J. W. Allen, Secretary; R. K. Lowry, Treasurer; R. E. Bextine, Chairman; J. L. Stark, 1st Vice-Chairman; and E. H. Reinschmidt, Jr., 2nd Vice-Chairman of Cedar Rapids Chapter

Chairman W. H. Lentz of Greater New York Chapter briefs his officers just before the first meeting conducted under their administration. Left to right, standing: Julius Schoen, 1st V.-Chm.; and Carl Kertesz, Treas.; seated, Mr. Lentz and E. Galvin, Secy.

Bicycle Manufacturer Produces Own Tubing

Springfield, Mass.—How a medium-sized plant has been able to install and operate its own tube mill, efficiently and profitably, for the past nine years, was revealed to Springfield Chapter, by Norman A. Clarke, Vice-President and Factory Manager, Westfield Mfg. Co., Div. Torrington Co.

Addressing about 65 members and guests, May 10, at a dinner meeting in the Hofbrauhaus, West Springfield, Mr. Clarke discussed the "Principle of Resistance Welding and the Function of an Electroweld Tube Mill as It Pertains to the Bicycle Industry."

The story of this firm's success in independently producing welded steel tubing, of great interest to companies using such tubing, was much appreciated by the audience.

A technical film, "Production Miracles Through Controlled Air Power," released by the Bellows Co., was presented by Donald B. Guy, local Field Engineer for that company.

Arthur Owen, Chief Engineer at Westfield Mfg. Co., was technical chairman for the evening.

Brief comments concerning editorial activities were made by Frank W. Curtis, National Editorial Chairman, and Richard S. Brown, Chapter Editorial Chairman. George R. Brown, Chapter Chairman, opened the meeting and reported on the Worcester Regional Meeting, with Wendell Ingham, Second Vice-Chairman.

Talks on Quality Control

Louisville, Ky.—O. H. Somers, Production Gage Engineer, The Standard Gage Co., Poughkeepsie, N. Y., addressed about 75 Louisville Chapter members and guests attending a dinner meeting May 12 in the Kentucky Hotel.

His lecture, "Tools for Dimensional Quality Control," was augmented with a demonstration of instruments and control charts. The enthusiastic audience asked numerous questions concerning problems confronting them in their plants.

Dollars Reward Winners Of Heat Treat 'Quiz'

New York City—"Professor I. Q." Thomas J. Donovan, Jr., of Philadelphia, ASTE National Director, presented his technical 'quiz' program for Greater New York members attending a recent Chapter meeting.

Equipped with a bag of silver dollars, the Professor awarded "cartwheels" for the right answers to his questions, with half-dollars consoling those who came up with partially-correct guesses.

The quiz and the ensuing discussion were largely devoted to heat treatment. When the "quiz kids" queried the Professor, he held his ground, demonstrating a comprehensive knowledge of his subject.

The meeting was the first to be conducted by the new Chapter officers. They are: Chairman William H. Lentz, Works Manager, American Machine & Foundry Co.; First Vice-Chairman Julius Schoen, Research and Development Engineer, S & S Corrugated Paper Machine Co., Inc.; Second Vice-Chairman Vallory H. Laughner, Associate Editor, *Machinery;* Secretary Edward Galvin, Owner, Tool Sales Co.; and Treasurer Carl Kertesz, Co-Owner Die Jig Corp.

Chairman Lentz addressed the gathering of some 160 members and stressed the effort necessary to meet the Chapter membership goal.

Mr. Donovan deposited a $50 check with the Chapter Treasurer, to be awarded to the first member enrolling 15 new members before March 3, 1949.

At the conclusion of the program, refreshments were served.

Claims Los Angeles Leads in Industrial Development

Los Angeles, Calif.—How Los Angeles in only nine years doubled its industry and increased its population 48 percent was related by James F. Bone, Manager, Industrial Div., Los Angeles Chamber of Commerce, in an address, May 13, before Los Angeles Chapter.

Outstripping all other cities in industrial growth, Mr. Bone stated, the southern California metropolis in 1939 employed 120,000 workers in some 450 shops and factories; now provides jobs for 250,000 in from 8700-9000 manufacturing establishments.

Predominant industries listed are: aircraft, motion pictures, oil tools, auto assembly (second only to Detroit, with 650,000 cars annually), rubber goods, petroleum refining, food, furniture, and wearing apparel.

Technical subject for the evening was "Fiberglas Reinforced Plastics and Fabrication," presented by Donald Colburn and Erven White of Owens-Corning Glass Corp.

A diversified display, augmenting the speakers' discussions, acquainted the audience with an almost endless variety of Fiberglas products.

Their company, the speakers indicated, is the major user of phenolic binders and the largest owner of platinum, processing several tons per month. Daily production of glass wool is 150 carloads.

Using layers of glass cloth, phenolic binder mixed with a catalyst, and a hemispheric form as mold, Mr. White performed an actual demonstration of the making of phenolic impregnated fiber glass parts.

J. F. Bone (left) of the Los Angeles Chamber of Commerce, tells the ASTE Chapter there how their city leads the country in industrial growth. Right: Erven White, of Owens-Corning Glass Corp., lectures as he demonstrates making of phenolin impregnated Fiberglas parts, using layers of glass cloth and phenolic binder mixed with a catalyst, formed over a hemispheric mold, while Donald Colburn, an associate, holds microphone. Below: Section of the dinner group present for session

Education Can Overcome Communism, Says Editor

South Bend, Ind.—Past Chairmen of South Bend Chapter were feted at a meeting, May 11, in the Izaak Walton League clubhouse.

Honor guests were Ernest B. Barber, Horace Wentzell, Stanley Cope, Frank Foote, Arthur Regan, Paul Winkelmann, Edgar Helm and Carl Stevason. Tribute was also paid to the late Lester St. Clair, another former Chapter head.

Andrew E. Rylander, Technical Editor of *The Tool Engineer*, discussed "The Social Aspects of Tool Engineering." The general public, he stated, needs more knowledge of world and national conditions. Since ignorance and poverty foster communism, these evils should be overcome with more adequate education and training, and by teaching youth the dignity of labor.

The people of Asia and Africa he cited as intelligent products of a civilization much older than ours, but backward in industrial experience. In order to have a stabilized world without want, it will be necessary to train these workers in the mass production of goods.

Although industry is now running at peak capacity, Mr. Rylander believes there is danger that it may soon drop for lack of markets. Statistics, he observed, show 27% of the population to be living beyond their means.

* * *

At the previous meeting M. A. Partha Sarathy, graduate of the University of Mysore, India, and now a student of Notre Dame, gave the Chapter "A Glimpse of Industrial Progress in India." He traced India's rise from architectural activities in the construction of temples and palaces two thousand years ago.

A rebirth of Indian manufactures began with Mahatma Gandhi's efforts in organizing home industries to boycott Britain. Large installations, such as the Tatra Steel Combine, developed during the last war, now produce over one and one-half million tons of steel.

Honor guests at South Bend Chapter Past Chairmen's Night are, from left: Horace Wentzell, Stanley Cope, Frank Foote, Arthur Regan, Paul Winkelmann, Carl Stevason, and Edgar Helm, all former heads of this Hoosier group

Cleveland to Offer More Scholarships

Cleveland, Ohio—Cleveland Chapter will continue awarding engineering scholarships, Edward Dase, Education Chairman, has announced.

The local Chapter is the first to offer a $500 scholarship. The award is unique in that the rules are broad, not confining, and have only one restriction: the winner must be a citizen of the Greater Cleveland area attending a bona fide engineering school and must have completed his junior year.

Another project planned by the Committee is a library service for local tool engineers.

* * *

Headed by C. W. Buxton, the Editorial Committee expects to expand the Chapter bulletin, *The Tool Post*, to include personality, educational and timely events columns, a digest of Chapter activities, and articles contributed by members. Martin George, John Beggs and Andrew Cirbus also serve on this committee.

* * *

Program for the coming season is being developed under the direction of Andrew B. Clark and Andrew Cirbus, Program Chairman and Co-Chairman, respectively. Their committee consists of Zoltan Balogh, E. W. Baumgardner, Harry Gammeter, Jack Gbur, J. I. Karash, Theodore Laping, H. B. Osborn, Jr., R. R. Rhodehamel, William Reiff and C. W. Scheihing.

The Committee has adopted an innovation in obtaining the type of presentation desired by the membership. At each meeting members are asked to fill in cards, indicating the approach or emphasis they would like the speaker to make.

Engineering discussions give way to sociability as Hamilton Chapter observes fourth Annual Ladies Night. Behind rostrum at speakers' table in rear are G. H. Medhurst of Frigidaire Products of Canada, Ltd., principal speaker, and Gordon Hall, Chapter Chairman. Toronto and Niagara District members and their wives are among guests

Files Vie with Machines In Precision Production

Pittsburgh, Pa.—With no motive power other than the human arm and fingers, a file will duplicate what any machine can do, George F. Hawkins, Assistant Advertising Manager, Heller Brothers Co., Newark, N. J., asserted in a talk May 7 before 65 members of Pittsburgh Chapter.

Shaping, mortising, planing and turning, Mr. Hawkins explained, can all be accomplished with some of the 7000 kinds of files available.

Often subjected to abuse, the file should be used as carefully as any other precision tool. Its precisely cut teeth smoothly and quickly shear metal along a broad surface. Variation in depth of teeth, spacing, pitch or rake, and number of teeth per inch determine how much and how smoothly a file will cut. Therefore, the speaker stressed, it is important to select the right file for the job.

American mass precision industries ranging from watchmaking to foundry work, were quoted by Mr. Hawkins as demonstrating that there is scarcely a consumer product but is a result of good filing.

"Files on Parade," a sound film, augmented the lecture with a visualization of file manufacture from bar stock to packaged product.

W. B. Peirce, former Society President, announced the formation of a group of about 100 Westinghouse apprentice students to be affiliated with the Chapter.

Frank Boyd, First Vice-Chairman, introduced the speaker. Walter Risser, Chairman, presided and presented new members and guests.

Multislide Feats Amaze

Indianapolis, Ind. — The seemingly impossible was performed on the screen at the May 6 meeting of Indianapolis Chapter, when representatives of the U. S. Tool Co., Inc., showed color films of the Multislide machine in operation and discussed its applications.

The pictures depicted many difficult jobs being run at lightning-like speed, with astounding accuracy. The versatility of the machines stretched the imagination even of those who work with them daily.

Hamilton Fetes Ladies With Dinner and Dance

Hamilton, Ont.—For the fourth time, Hamilton Chapter honored its ladies with an annual dinner and dance, held May 14 at Fischer's Hotel.

G. H. Medhurst, Niagara District Supervisor of Sales, Frigidaire Products of Canada, Ltd., was guest speaker, lecturing on "Frozen Foods." Importance of selecting high quality foods as well as immediate and careful preparation for freezing were stressed by Mr. Medhurst.

A Technicolor, sound film gave a visualization of food preservation methods through the ages as contrasted with the modern quick freeze process.

Doris B. Pratt, ASTE News Editor of *The Tool Engineer*, was a guest and spoke briefly concerning contributions of member and Chapter news and technical developments to the Society's magazine.

Entertainment was provided by Billy McGhie who mystified the crowd with his legerdemain.

After the magician's performance, prizes were drawn, and won by Mrs. Fred Settle of Brantford, Mrs. Carl Hawley, Galt; Mrs. Joseph Little, St. Catharines; Mrs. F. S. Langford, Mrs. William Alexander and Mrs. Betty Killingbeck, all of Hamilton.

Dancing and a social get-together concluded the pleasant affair.

Gordon Hall, Chapter Chairman, presided; George Gilmour, First Vice-Chairman, gave a toast to the ladies, and Mrs. Hall responded with a toast to the men. Mr. Medhurst was introduced by William B. Alexander, Standards Chairman, and thanked by William Shaw, Program Chairman.

Guests among the 140 present also included visitors from Niagara District and Toronto Chapters.

Hancock Joins Humber

Wolverhampton, Eng.—E. W. Hancock, M.B.E., has joined the Board of Humber Co., Ltd., the Rootes Group has announced. In his new association, Mr. Hancock is assuming the duties of General Works Manager.

Well known in automobile and allied industries, he has been Works General Manager with Rubrey, Owen & Co., Ltd., since 1942.

Multiple Spindle Work Adaptable to Short Run

Montreal, Que.—Multiple spindle drilling and tapping machines can be used profitably on short runs, said R. A. Schafer, Chief Development Engineer, National Automatic Tool Co. Inc., Richmond, Ind., at a meeting of Montreal Chapter, May 13, in Canadian Legion Memorial Hall.

His illustrated lecture, "Multiple Drilling and Tapping for Production," dealt with a wide range of hydraulic feed, multiple spindle drilling and boring machines, and electrically-controlled tapping machines.

Using slides, Mr. Schafer showed how multiple-spindle work could be applied to small lots with adjustable spindle machines. In these machines spindle drive is accomplished through universal joints on the drive shafts, and the spindles themselves are adjustable over a wide range of center distances.

A special purpose, horizontal machine used in automobile plants for complete machining of all holes in axle housings commanded unusual interest, the parts being moved automatically from station to station by push-button control.

A. M. Rice, Editorial Chairman, addressed the meeting briefly on the duties and functions of his committee, in the first of a series of such talks by Chapter Committee Chairmen. Emphasizing the importance of publicity in the *ASTE News* section of *The Tool Engineer*, he appealed to the members for news items.

He also stressed the value of technical articles suitable for publication and of interest to tool engineers everywhere, closing his talk with an appeal for volunteers to serve on Chapter committees.

Sixty-five were present for the final meeting of the season.

Mahlmeister Sees Trend Toward Gaging at Machine

Buffalo, N. Y.—Best type of gage to use depends upon the limits to which you are confined and on details of the job concerned, although present gaging practice is primarily pointed toward cost reduction. There is a definite trend toward amplification in gaging and to more gaging at the machine to check parts and correct variations immediately.

Addressing an audience of Buffalo-Niagara Frontier members at the closing meeting of the season, held May 12 at Buffalo Trap and Field Club, Louis Mahlmeister, Manager of Gage Sales Engineering Dept., The Sheffield Corp., Dayton, Ohio, went on to deal with recent developments in gaging. He also described policies successfully employed by manufacturers in various fields, types of gages and their applications.

Considerable interest was evidenced by a lengthy open discussion following Mr. Mahlmeister's lecture, "Modern Concepts of Gaging."

Chairman Garrett Kingston announced that the annual stag outing would be held September 11 at Walker's Grove.

Massive Machinery Viewed In Canadian Eng'g Plant

Montreal, Que. — Seventy Montreal members were guests of Dominion Engineering Works, Ltd., Lachine, May 27, for a tour of the huge plant producing equipment for heavy industries such as pulp and paper, hydro-electric power, steel mills, construction, mining, plastics, and shipbuilding.

First department visited was the paper machinery section where paper mills are fabricated and assembled. Here the guests saw a partial assembly of one of these enormous machines.

Keen interest was exhibited in construction of the rolls, particularly the rubber-covered drying rolls in which thousands of small holes are drilled with a special machine and countersunk by an operator sitting inside the roll, using an electric hand drill.

In the main plant the group was amazed at the size of the machines. Cast rolls up to 10 feet in diameter were being turned on gigantic lathes. Chilled cast-iron rolls are machined with tungsten carbide tools. Surface flaws must be eliminated, the guides explained. If serious defects occur, the roll is scrapped.

Highlights of the tour included a gear-cutting machine handling herringbone gears over 10 feet in diameter; the foundry in which 80-ton castings have been poured; a 35-foot boring mill on which a cast iron turbine ring 25 feet in diameter and about 15 feet high was being machined.

Other points of prime interest were a line where power shovels and construction machinery were being assembled; the Diesel engine department; a hydraulic lamination press being tested before delivery; a giant ore crusher, also on the test stand; and the well-equipped tool room.

Of special interest from a tool engineering viewpoint was the versatility of tooling and equipment, and the efficient placing of machinery to minimize handling.

After the tour, refreshments were served in the staff cafeteria. George Clarke, Chapter Chairman, thanked company officials for their hospitality, and congratulated them on the excellence of their organization and production methods.

Our Society

By HARRY E. CONRAD, *ASTE Executive Secretary*

Congratulations, Portland, Maine! Portland, Chapter No. 46, was the first Chapter to accomplish a perfect score of no delinquents in our recent campaign of establishing all members on the "members in good standing" list. Many other Chapters have done a truly remarkable job in cutting down the number of their delinquents which indicates definite progress in the right direction.

While, in our thinking pertaining to members, we are quite prone to spend most of our efforts on getting new members, we cannot lose sight of the fact that we must, in order to maintain our progress, retain old members as well.

The recent series of Regional Meetings is now completed and the progress made at these meetings has been most encouraging. In addition to affording an opportunity for the Chapter Officers and Committeemen to meet with the National Officers and Committeemen to discuss their respective problems, these meetings have done much in stimulating the ASTE spirit throughout the land.

Emphasis on Better Service

The keynote of all Regional Meetings has been "better service to the member" in line with individual member's wants. This is to be accomplished through the co-ordinated efforts of our entire organization with everyone working toward our common objectives.

Better programs at national meetings as well as at Chapter meetings is one of the major aims as well as building closer relationships and a more active spirit of co-operation throughout our entire organization. All of which, of course, can contribute much toward our ultimate objective—the recognition toward professional status.

In addition to the activities promulgated and carried out with the co-operation of Chapter Officers and Committeemen, our recently concluded Tool Engineers Industrial Exposition has accomplished much in building a better understanding of ASTE's objectives and has gone far in contributing to the increased prestige of our organization. Literally hundreds of complimentary letters have been received bearing out the above facts.

Interest in the forthcoming Semi-Annual Meeting to be held in Los Angeles October 11-13, has been most encouraging. If interest continues at the present rate of development, there will be no question about our ability to finalize our arrangements for the special train leaving Chicago for Los Angeles and taking in the Grand Canyon tour enroute.

Many members have availed themselves of this opportunity for the vacation of a lifetime and early indications are that the Los Angeles Semi-Annual will be most successful. An excellent program has been set up for this meeting and detailed information will be published in the August issue of *The Tool Engineer*.

Formal action has been taken by the Board of Directors toward another great step in the building of stability for our organization. Authorization has been given for the purchase of property with the intentions of building a suitable home for ASTE activities. More information on this subject will be forthcoming as our plans develop.

Center: "Prof. I. Q." Donovan awards silver dollar to J. X. Ryneska, Past Chairman of Boston Chapter, at quiz program which Mr. Donovan conducted there. At left and right are: F. C. DiPerseo and O. W. Bonnafe, speakers

Broaching Refinements Described by Bonnafe

Boston, Mass.—Latest developments in Surface Broaching as presented by Oliver Bonnafe, Chief Research Engineer of Lapointe Machine Tool Co. and a Chapter member, featured the final program of the season for Boston Chapter. The dinner meeting, attended by 175 members and guests, was held May 20 at New England Mutual Hall.

Two color films showing surface broaching machines in actual operation augmented Mr. Bonnafe's talk. A subsequent question period was conducted by the speaker assisted by W. J. Phaneuf, also of Lapointe.

As an added attraction, Technical Chairman Harold Lundstrom of W. H. Nichols Co. presented Thomas J. Donovan, Jr., ASTE National Director, of Philadelphia, as "Professor Quiz" in a sparkling hour of entertainment with "Dollars or Fishcakes" for the contestants.

Another speaker, Frank C. Di Perseo, of the Army Air Force Procurement Office in Boston, told the assembly how to proceed to secure government contracts for the new air force program.

William Jarvis, Hartford Chapter Chairman, and President of Jarvis Mfg. Co., Middletown, was a speakers' table guest.

Tool Engineers' Handbook Authors

Biographical Briefs

Cutting Tool Design Committee

Frederick W. Lucht, Development Engineer at Carboloy Co., Inc., Detroit, Mich., is Chairman of the Handbook Cutting Tool Design Committee.

Except for a brief teaching assignment at Colorado School of Mines, Mr. Lucht has been constantly engaged in research and practice in improved application of high-speed steels and cemented carbides to milling operations. Since 1936 he has specialized in cutting tools at Carboloy.

An M. E. graduate of the University of Michigan, Mr. Lucht has addressed gatherings of ASME and ASTE. He is a member of both societies and of the Engineering Society of Detroit.

* * *

Thirty years of practical mechanical experience from toolmaker to works manager have preceded 10 years' specialization in drilling and boring of deep holes by **Harry L. Armiger,** Senior Partner in Conner Tool & Cutter Co., Detroit.

F. W. Lucht

E. G. Moffat

While serving as deep hole drilling advisor for large industrial plants, he has accumulated a comprehensive knowledge of the field, visiting most U. S. firms engaged in this work.

* * *

Advancement of professional and educational activities have always been a prime interest with **Archibald N. Goddard,** Chairman of the Board, Goddard and Goddard Co., Detroit.

He has lectured on metal cutting before trade and college groups. He is a trustee of Cranbrook Institute of Science, Bloomfield Hills, Mich.; a charter member, Director, Treasurer, and Finance Chairman of the Engineering Society of Detroit.

Other professional affiliations include membership in Detroit Chapter, ASTE, ASM, and a life membership in ASME. Through his hobby of minerology, he holds membership in the Michigan Mineralogical Society.

In 1945 Wayne University, Detroit, conferred on Mr. Goddard an honorary Doctor of Engineering degree. His B. S. in M. E. was granted by Worcester Polytechnical Institute.

Before organizing his company in 1917, he was Superintendent of Morgan Construction Co. and of Union Twist Drill Co., Detroit.

As a youth working in machine tool shops, **Harry Gotberg,** Chief Engineer, Colonial Broach Co., Detroit, burned the midnight incandescents studying technical subjects. His self-directed education embraced an Industrial Management course in which he was awarded a diploma.

His association with Colonial dates back to 1930 when he began a 10-year

Harry Gotberg

Lewis Skeel

C. R. Staub

O. E. Koehler

service of designing, estimating, and field engineering before receiving his present assignment.

Widely known in engineering circles, he has read papers before national gatherings of ASTE, ASME, and SAE. He is a member of the latter organization and of an ASA committee that standardized involute splines.

* * *

Such widely divergent occupations as railroading, bakery management, manufacture of firearms, machinery and tools have all been taken in stride by **Oscar E. Koehler,** Chief Engineer, Greenfield Tap and Die Corp., Greenfield, Mass.

He acquired his technical training through three years of private tutoring, following graduation as an honor student from New Haven High School.

Armed with a wealth of industrial production experience gained in Connecticut metal working plants, Mr. Koehler began his association with Greenfield Tap and Die in 1926, rising to Chief Engineer four years later.

He holds a number of patents singly or jointly, is the author of an article on Thread Gage Design, published by the New England Water Works Association; has addressed that organization, ASTE, and the Screw Machine Products Association.

Among his affiliations are: SM, ASTE, SAE, the Army Ordnance Association, and the National Council of Boy Scouts of America.

* * *

E. G. Moffat left his post in the Refrigeration Div. of General Electric Co.'s Schenectady plant to answer a call to active duty as an Army Ordnance Reserve Officer. Assigned to Watervliet Arsenal as Assistant Works Manager in January of 1941, he became Lieutenant Colonel and Works Manager, was again promoted at the end of the war to full Colonel and awarded the Army Commendation Ribbon.

Back in civilian ranks, he joined Firth Sterling Steel & Carbide Corp., McKeesport, Penna., in 1946, as Manager of the

H. L. Armiger

E. M. Staples

G. H. Sanborn

A. N. Goddard

Carbide Tool and Die Div., his present capacity.

American Machine, Engineering Journal (Canada), and *Mechanical Engineering* have published his papers on carbide milling and ordnance production. He has lectured before The Engineering Institute of Canada, and ASME, and produced a high speed film of carbide milling, presented before the latter group.

Mr. Moffat is a member of The Society for the Advancement of Management, The Wire Association, and the ASME Technical Committee on Single Point Tools and Tool Holders.

* * *

Practically reared in the gearing equipment business, **George H. Sanborn** is now Chief Field Engineer of The Fellows Gear Shaper Co., Springfield, Vt., with headquarters in Detroit.

His high schooling at Springfield and college study at Northeastern University, Boston, were both on a cooperative basis, with alternate classroom theory and practical work at the Fellows plant. By the time he received his M. E., he had worked in nearly every department.

From graduation in 1924 until 1937 he was connected with the factory Engineering Department. He now advises on gear design, equipment, methods, and

trouble spotting for most of the outstanding plants with gear work, in the U. S. and Canada.

Besides membership in ASTE and the Engineering Society of Detroit, Mr. Sanborn represents his company in SAE, the American Gear Manufacturers Association, NMTBA, and other special committees and councils.

He has given many gear talks before engineering societies, university and special training classes, including more than 30 ASTE Chapters.

* * *

Lewis Skeel is Chief Engineer of McCrosky Tool Corp., Meadville, Pa. In this post he has had charge of product design, tool engineering and all plant engineering for the past 11 years.

He is affiliated with Central Pennsylvania Chapter, ASTE, a director of Drafto Corp., Cochranton, Pa., and a member of the Technical Committee on Standardization of Inserted Blade Cutters of the Milling Cutter Div., Metal Cutting Tool Institute.

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Early in his industrial career **Evans M. Staples** was employed as Research Associate with the U. S. Bureau of Standards at Washington. Then he joined Johnson Bronze Co., Newcastle, Pa., as Metallurgist.

For several years he managed the Bronze Div. of Aluminum Industries, Cincinnati, until 1936 when he became associated with The Staples Tool Co. there, the firm he now heads.

Mr. Staples is a graduate of the University of Manitoba, Canada, and a charter member of Cincinnati Chapter, ASTE. * * *

A thorough grounding in engineering of transmission and rear axle gears, and experimental gearing at automotive plants in the Detroit area preceded **Charles R. Staub's** association with Michigan Tool Co. as Chief Engineer. During his 18 years with this firm he has also acted as consultant engineer on high speed turbine and reduction units.

A wartime member of the ASA committee to evolve the present involute spline standard, he chaired the Involute Spline Committee of the American Gear Mfrs. Association, and worked on the Central Aircraft Council of the Automotive Council for War Production.

Current activities include membership in the SAE Parts and Fittings Committee, the Executive Committee of AGMA, and chairmanship of that association's General Engineering Committee.

Choosing Cutting Fluids

Fond du Lac, Wis.—May meeting of Fond du Lac Chapter was held May 14 at Kaukauna, Wis., with approximately 80 members and guests present.

H. J. Brenneke, former instructor at New York University and now associated with the Socony Vacuum Oil Co. at Milwaukee, lectured on "Selection of Fluids for Metal Cutting." Colored slides, a brief history of the subject, its fundamentals, and newest developments accompanied the talk.

Entertainment included several films.

Sees Higher Productivity Through Human Relations

Cincinnati, Ohio—"Eighteen to twenty percent increase in production is possible if potential worker cooperation is developed," Dr. Phillips Bradley, Director, Institute of Labor and Industrial Relations, University of Illinois, told an audience of 150 attending Cincinnati Chapter Tenth Annual Dinner, May 8, in Hotel Alms.

Dr. Bradley pointed out that human relations is the one undeveloped source for increased productivity and has resulted in the trend toward turning over personnel problems from staff to line administration. This has brought about the major problem of converting the "line" man to the "trainer."

Also addressing the group were Irwin F. Holland, ASTE President, and the Hon. James G. Stewart of the Supreme Court of Ohio.

Following a precedent of several years, a group of men prominent in industry and education were present as guests of the Chapter. They were: D. A. Patterson, Pres., Avey Drilling Machine Co.; G. W. Denges, Williamson Heater Co.; L. L. Weber, Vice-Pres., Special Products Div., and H. Cuni, Plant Mgr., Lodge and Shipley; A. Kullman, Vice-Pres., American Tool Works.

C. D. St. Clair, Works Mgr., Lunkenheimer Co.; W. Klayer, Works Mgr., Aluminum Industries; W. B. Winters, Chief Engr., American Can Co.; R. L. Smith, Professor of Mech. Eng., University of Cincinnati; and F. W. Schlicter, Pres., Hamilton Tool Co.

Industrialists, educators and Society officers were guests at Cincinnati Chapter's Tenth Annual Meeting. Top, from left, standing: E. L. Routzong, Chapter Treas.; I. F. Holland, ASTE Pres.; G. F. Bradley, Secy.; G. R. Squibb, Past Chm.; and H. N. Peters, 2nd V.-Chm.; seated: G. H. Simon, Chm.; Dr. Phillips Bradley, of University of Illinois, guest speaker; H. M. Hopkins, Works Mgr., Tool Steel Gear and Pinion Co.; Judge J. G. Stewart; and Henry Bruewer, 1st V.-Chm.; Below: Partial view of the approximately 150 who attended dinner at the Hotel Alms

Cites Multiple Drilling As Widely Applicable

Toronto, Ont.—Production time can be saved in almost any industrial plant by the addition of modern multiple drilling and tapping machines, R. A. Schafer informed Toronto members at their May 5 meeting.

Mr. Schafer, Chief Engineer for the National Automatic Tool Co., Richmond, Ind., having devoted many years to designing and building hydraulic feed, multiple spindle drilling and tapping machines, covered this subject thoroughly in an informal, easily understood talk.

Using slides for illustration, the speaker invited his audience to ask questions immediately on any point needing clarification. This proved a highly successful means of imparting knowledge.

All types of standard and special machines of revolutionary design were depicted and described in detail. Production figures were quoted and much practical information was divulged.

Chairman John Lengbridge presided and urged increased efforts to reach the membership goal.

Chemist Introduces Nylon As Engineering Material

Bridgeport, Conn.—"Nylon as an Engineering Material" was presented by D. B. Hanson, chemist of E. I. DuPont de Nemours & Co., Inc., Wilmington, Del., to Fairfield County members meeting May 5 at the Stratfield Hotel.

Superior to other thermoplastics in that it does not soften until the temperature goes well over 300° F, nylon may be reheated and reshaped a number of times, Mr. Hanson explained.

In the electrical field, he pointed out, it is used as insulation for bare wire, over primary insulation, and for coil forms. As a valve seat, it eliminates costly hand-lapping and has the advantage of lighter weight than the all-metal seat.

With the aid of slides, Mr. Hanson described the nylon manufacturing process and type of injection moulding machines employed. The material may also be extruded, he added.

A new product with varied applications, nylon can serve engineers alert to its possibilities, the speaker concluded.

Behind the DEADLINE

By Doris B. Pratt

The Editor tells Chapter Editorial Chairmen how to make the most of the ASTE News section

Your Chapter news stories are only as good as the material submitted. Having no clairvoyant powers and no magic carpet, your Editor cannot personally report some 75 meetings a month. We must depend upon the Editorial Chairman of each Chapter to inform us of the activities of his group and of individual members.

Some Chapters are doing a splendid job of publicizing themselves, others report sporadically, and a few let the light of their achievements remain hidden under a bushel.

Let's make the slogan: "More news, more often, more promptly."

Here's how to report:

1. MEETINGS

Attend Chapter meetings—get your information first-hand. Dont rely upon printed meeting notices—the program may be changed. Don't copy the Secretary's minutes—his responsibility is to record Chapter proceedings, not to write a news story.

Equip yourself with a notebook, pencil, and penlight to enable you to take notes of interesting film sequences of slide illustrations.

Complete, Correct Factual Data

Enter the date, place, and nature of the meeting, if it is a special function. Remember the first essentials of a news story: who, what, where, when and how.

Obtain full and correct names and titles of speakers or others participating in the program. Not "Ed," "Jake," or Mr. Jones. Rather: "Edmond J. Jones, Vice-President in Charge of Production, Blank Co., Detroit, Mich."

A reader in some other part of the country may wish to contact Mr. Jones for help on the subject discussed at your meeting. Or a Program Chairman of another Chapter may be so impressed with the account of the lecture that he may decide to invite Mr. Jones to address his Chapter.

Include the actual title of the lecturer's talk. While he is speaking, jot down all the salient points and interesting statements made. Above all, be accurate especially with figures, otherwise you may cause embarrassment to your speaker, his company, your Chapter, the Society, and of course, yourself.

Summarize highlights of the discussion period. If there was another speaker on a non-technical subject, report his part in the program.

Include Other Program Highlights

Mention other events, such as presentations of awards, announcements of important new undertakings or special Chapter achievements, along with *full* names and Chapter offices of the persons concerned. The more research the Editor has to do on your reports, the less time she can devote to them editorially.

Within 24 hours, if possible, while your impressions are still fresh, write your story for *The Tool Engineer*.

Go over your notes analytically. Did the speaker make some important, arresting statement that would capture the attention of your prospective readers? If so, you might use this for your opening, identifying the statement with the speaker and the occasion.

Then develop your theme around this, selecting the most pertinent items from your notes, discarding less significant ones. Write what you would like to know about this meeting, if you had been absent. (Incidentally, good reports can help stimulate attendance at Chapter meetings by making inactive members realize what they have missed.) Work in other events of the evening in the order of their importance.

Keep publication dates in mind. Do not use future tense in referring to something that will be in the past when the magazine is delivered (10th to 15th of the month).

Names Make News

If there were distinguished guests or out-of-town visitors, include their names and Society or business affiliation. A listing of local industrialists who attended an Executives Night meeting means little in another area unless their identity is established.

Now check over your draft for omissions and inaccuracies, eliminating superfluous words and repetition. Submit the finished report, preferably in double-spaced typewriting on the *blue* Editorial Committee report form furnished by the Society, to the ASTE News Editor, *The Tool Engineer*, 550 W. Lafayette, Detroit 26, Mich. Be sure your name and address are filled in, to save sleuthing in trying to acknowledge your contribution.

It might be well to keep a copy of this report and send another along to your Chapter Chairman.

The 10th of the month is the deadline for ASTE News to be published in the following issue. If your meeting occurs on or after this date, submit your report promptly anyway, relieving some of the Editor's deadline rush. Your story will be scheduled for the subsequent issue.

The next article in this series will deal with news photography.

Rylander Awarded Medal By King of Sweden

Detroit, Mich.—For distinguished service in connection with the Swedish Pioneer Centennial in America, Andrew E. Rylander, Technical Editor of *The Tool Engineer*, was awarded a medal by King Gustav of Sweden.

Prince Bertil, grandson of the King, presented the medal during a banquet in Chicago, June 16, marking King Gustav's 90th birthday. A certificate of award and autographed photographs of the Swedish monarch and his representative accompanied the silvery medal bearing the King's likeness.

Other medal recipients and Prince Bertil's aides and official delegation were among the 60 dinner guests. The function followed a two-day Centennial festival in Detroit, June 13 and 14, chairmanned by Mr. Rylander. Outstanding features of the Detroit celebration were a public convocation attended by about 5000, and a testimonal banquet sponsored by prominent citizens of Swedish extraction.

One of several similar observances held throughout the Middle West, the Detroit Centennial commemorated the arrival of the first Swedish settlers in 1848.

A. E. Rylander (right) presents Carl Berglund, Swedish Vice-Consul for Michigan, to Prince Bertil (facing camera) of Sweden, as the Prince arrives at Detroit for Swedish Pioneer Centennial. At left is Nils W. Olsson, of Chicago, Executive Secretary of Centennial Association. Below: Medal, awarded by King Gustav for Mr. Rylander's outstanding service as Chairman of Detroit festival, was presented by Prince

Wondering where to spend your vacation? Come along with ASTE to the Los Angeles convention.

Claims Carbides Meet All Cutting Requirements

Poughkeepsie, N. Y. — Qualifications of a good cutting tool material are: (1) hardness or resistance to deformation under force; (2) strength or resistance to breakage under load; and (3) a surface that does not gall the material, stick to hot steel chips or cause the condition known as cratering.

Tungsten and titanium carbide in the proper grade, depending on the material to be cut, meet these requirements, according to Philip M. McKenna, President of Kennametal, Inc. Mr. McKenna lectured on "Carbide Tools and Appliances" before 80 members and guests attending the May 11 dinner meeting of Mid-Hudson Chapter.

The speaker dealt considerably with technical background, showing microphotographs of tungsten carbide structures. Stating that the crystals must have interlocking surfaces to withstand stresses, he explained that straight carbide is recommended for cutting cast iron, bronze and other non-ferrous metals. Addition of tungsten-titanium provides a crater-resisting material which effectively cuts steel.

Advantages of clamping carbide tips, over conventional brazing methods, were described and illustrated, as well as special purpose tools.

During a short business meeting preceding the technical session, committee appointments were announced by Chairman Llewellyn H. Tenney.

L. Hamilton Krissler of the Krissler Business Institute gave a coffee talk, "Are We Building Bridges or Tearing Them Down?"

Over 300 See Falk Plant

Milwaukee, Wis.—For their May meeting Milwaukee members visited the Falk Corp., an industry established more than half a century ago.

After dinner in the plant cafeteria, the party gathered in the training room to meet guides for a tour through the plant.

A record attendance of more than 300 saw the manufacture of speed reducers, motor reducers, herringbone and single helical gears, heavy gear drives, marine turbine and Diesel engine gear drives, and clutches. Particular interest was shown in gear cutting and the pouring of steel castings.

The plant visitation concluded the formal season program.

Annual Bowling Night

Rochester, N. Y.—An evening of recreation was enjoyed by approximately 175 Rochester members and their guests who participated in the Chapter's annual Bowling Party, May 14, at Eagles Hall.

Bowlers competed for high and low score prizes, while the less-athletically inclined engaged in card games.

Refreshments were served during the games, and the entertainment concluded with a buffet lunch and prize awards.

Entertainment Chairman C. E. Sears was in charge of the social event.

Fox River Valley Program Attracts More Than 200

A group of Fox River Valley officers and members go into a huddle with H. G. Baumgartner of Cincinnati Shaper Co., who gives some sidelights on press shearing. A record attendance of more than 200 members and guests heard Mr. Baumgartner discuss press brakes, shears, and their application to present day production, at June meeting

Broaching Advances Widen Applications

Toledo, Ohio—Through improved machines and high speed tool steels, great strides have been made in a method originally devised for machining keyways in bores, according to Kenneth N. Macomber, Chief Engineer, Lapointe Machine Tool Co., Hudson, Mass.

Lecturing before a Toledo Chapter audience of 104, May 12, Mr. Macomber discussed and illustrated "Latest Development in Surface Broaching."

Motion pictures showed applications to such varied products as motor blocks, loom frame ends, automotive bearing shells and wrenches. Particularly outstanding was the ingenuity displayed in the design and arrangement of automatically operated holding fixtures.

In the ensuing open discussion, Mr. Macomber elaborated on the films, and outlined "Electrolizing," a process utilizing high frequency current and a vacuum to deposite a layer of alloy .00003-.00005 inches thick on the exterior of a tool. This case, presenting a wearing surface of Rockwell hardness 80-81, was recommended by the speaker as an economical method of prolonging tool life.

Prior to the technical session, Genn Jackson, Program Director of Radio Station WSPD, described the forthcoming introduction of telecasting at Toledo.

Cannon Resigns, Heads Own Firm

Detroit, Mich.—The resignation of John M. Cannon, as Director of Public Relations of the American Society of Tool Engineers, was announced this month by Harry E. Conrad, Executive Secretary.

Mr. Cannon will devote full time to his own firm, John M. Cannon Associates, counsel on industrial and public relations, whose office is located in the Penobscot Building. Mr. Cannon has been associated with ASTE since 1945.

Precision of Today, Theme of Grinding Lecture

Springfield, Vt.—A sound film entitled "The New Bryant Internal Grinders" was the technical feature of a Twin States Chapter meeting held at Windsor Country Club, Windsor, May 12.

In conjunction with the film, Walter Smith, of Bryant Chucking Grinder Co., presented developments in precision hole grinding on the production line. His definition of precision is making as nearly perfect a part as the machine is capable of producing. Examples were shown of holes ground to within a few millionths of an inch for size, roundness and taper.

Before the technical session, members and guests enjoyed a few holes of golf and an appetizing dinner.

The next meeting will be the annual outing, September 18, at Windsor Country Club. Plans are under way for a Ladies Night featuring a harvest supper and a semi-formal dance later in the Fall.

Installs Student Group

Indianapolis, Ind.—A new ASTE student group was installed by Indianapolis Chapter at Purdue University, Lafayette, May 28. Prof. Halsey F. Owen, National Education Chairman of the Society, opened the meeting of the group he had been instrumental in organizing.

After a few words to the 37 members present, Prof. Owen introduced Edward Sohn, recent Purdue graduate active in the organizational groundwork. Mr. Sohn pointed out that only interest in ASTE motivated those who joined.

Student officers installed are: Carroll Cook, Chairman; Carl Rodeman, First Vice-Chairman; Fred Meyer, Secretary; and Fred Feindt, treasurer.

Each Chapter member introduced himself and identified himself as to business affiliation and work experience. The students likewise were presented and gave their scholastic background and professional aspirations.

Nearly 100 couples dance at Chicago Chapter's annual Ladies Night held at the Furniture Club of America

Rockford Sees Automaking From Foundry to Driveaway

Rockford, Ill.—Automotive production was observed by some 60 members and prospective members of Rockford Chapter who were recent visitors at the Nash Motors plant in Kenosha, Wis.

J. A. Finkler, General Superintendent, welcomed the group, and Fred Burnett, Works Manager, reviewed the company's background and outlined the trip.

The tour began in the press room where hood tops and sides, oil pans, gasoline tanks and bumper bar uprights are manufactured; proceeded to the department where most of the 550 miscellaneous parts are machined and arc welded.

On each of the two final assembly lines, more than 13,000 parts, many previously sub-assembled, are put together to form a complete, tested and inspected vehicle, driven off the line under its own power.

Daily Output 42,000 Castings

After viewing the forge shop, the visitors inspected the foundry, which produces 42,000 castings daily. Here conveyors speed handling in coremaking and molding, cranes load furnaces and transport molten iron for distribution.

An underground conveyor transfers the rough motor cylinder blocks, cast two at a time in one mold, to highly efficient motor machining lines. One large machine noted drills, reams, and taps 130 holes simultaneously. A number of the members saw special machines made in their own plants.

Next stop was the motor assembly line. After assembly the motors are run in, using natural gas as fuel. Another eye-catcher was the crankshaft balancing machine.

Highlight of the transmission plant was the gear manufacturing department. Machining for rear-axle component parts is a precision operation, exemplified by the equipment used. Flame hardening and induction heating give gear teeth a wear resistant surface. Other heat treating methods employed range from salt pots to continuous type units.

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Replacing the previous annual Father and Son Night, Family Night, held in May at Lincoln Junior High School, was attended by 150 tool engineers and their families.

A spectacular color film of a canoe trip along the Colorado, "World's Most Dangerous River," was shown by Ray Eggersted of Elgin.

Coming Meetings

AKRON—September 13. Speaker: George Edgerton, Lincoln Park Industries. Subject: "Design of Carbide Dies."

BUFFALO-NIAGARA FRONTIER—Annual Stag Outing, September 11, Walker's Grove.

DAYTON—July 12, 6:00 P. M., Inland Gun Club, Fun Night.

ELMIRA—August, Annual Outing. September 13, 7:00 P. M., Mark Twain Hotel. Speaker: Earl W. Daugherty, Whitman and Barnes Co., Chicago. Subject: "Drill and Reamer Applications."

FOND DU LAC—August 15, Sherwood Country Club, Green Bay, Wis. Annual Summer Outing for members and friends. Golf, baseball, cards, children's games.

LOS ANGELES—October 11, 12, 13, ASTE 16th Semi-Annual Meeting, Hotel Biltmore.

TWIN STATES — Annual Outing, September 18, Windsor Country Club, Windsor, Vt.

Advises on Steel Choice

Providence, R. I.—George Schad, Carpenter Steel Co. metallurgist, delivered an informative address, "Trouble Shooting and the Selection of Tool Steel," before an enthusiastic gathering of more than 100 Little Rhody members attending a Chapter meeting May 19 at Oates Tavern.

At the conclusion of his clear and concise lecture, Mr. Schad assisted members who presented specific problems relating to his subject.

A social hour and dinner preceded the technical session.

Ladies Entertained

Chicago, Ill.—Approximately 100 couples attended Chicago Chapter's annual Ladies Night, held May 26 at the Furniture Club.

After dinner Harold Taylor, Chapter Chairman, welcomed the guests and introduced the master of ceremonies. A high-caliber, five-act floor show followed.

Each lady was presented with a set of guest towels. The evening concluded with dancing.

William Burke, Program Chairman, and the Entertainment Committee were in charge of the enjoyable event.

Says ASA Leads Efforts To Coordinate Standards

Hartford, Conn.—By coordinating management, labor, government, technology and consumer to develop a mutually satisfactory, consistent set of national standards, the American Standards Association is in the forefront in industrial standardization activity.

Dr. John Gaillard, an industrial consultant on standards and quality control, and Secretary of the ASA Mechanical Standards Committee, so indicated during an address, "Standardization—A Tool for Harmonious Cooperation," before a dinner meeting of 150 members and guests of Hartford Chapter, May 3, in the City Club.

American free standards were contrasted with the mandatory standards prevailing in Russia, violation of which is punishable by imprisonment.

Dr. Gaillard also reviewed the development of standards through the ages as humanity grasped their value.

Prior to the technical session, Burrell O. Brainard, of the Southern New England Telephone Co. Customer Service Dept. discussed "Mobile Telephone Service—Past, Present, Future."

Developed by his company in 1943 for wartime use, mobile telephones are now installed in planes, trains and automotive vehicles, said Mr. Brainard. No longer dependent upon wire connections, the telephone utilizes radio facilities, he observed.

After a brief explanation of the mobile units and its functions, the speaker held a conversation with a mobile user in an automobile some distance away. A lively question period followed.

President I. F. Holland and Chapter Chairman William F. Jarvis reported on the regional meeting at Worcester, Mass., May 2, also attended by Hartford members Richard Smith, Henry Kuryla, Robert Toppin, Clayton Parsons and Arthur Gustafson.

Saga of Aluminum, Credit To American Enterprise

Bridgeport, Conn.—The tooling, production, and industrial engineering responsible for aluminum's present low cost are a monument to American enterprise and "know-how."

Addressing Fairfield County Chapter at the June 2 meeting, A. R. Van Vorst, of the Aluminum Co. of America, went on to explain that 10 kilowatts of electric energy and two-thirds of a pound of carbon are required to make a single pound of aluminum selling for approximately 13 cents.

Current output is 1,100,000,000 pounds, a drop of 700,000,000 pounds from the all-time war peak, through closing of plants not efficient enough to maintain this low price. No further price reduction is seen for the near future, said Mr. Van Vorst.

During a brief business meeting, plans for next season were discussed. Members will receive a questionnaire this summer, to indicate the type of technical and entertainment programs desired.

10 Former Chairmen Honored at Rochester

Rochester, N. Y.—Past Chairmen were honored by Rochester Chapter at a dinner attended by 170 members and guests, May 3, in the Liederkranz Club.

Former Chapter heads recognized at the function included John Bartek, now of Detroit, Charles Codd, John Dense, Cecil Lucas, Clifford Sears, Sr., Joseph Schick, Chauncey Newton, Earle DeBischop, Charles Seely, and Milton Roessel. All were present except Mr. Lucas, detained by family illness.

Principal speaker was Ralph W. Weddell, President, Weddell Tools, Inc., Rochester, and a Chapter member.

In presenting theoretical and practical considerations in the design and use of metal cutting tools, Mr. Weddell discussed both single-point and multi-blade tools. Emphasis was placed on high production milling cutters, their mountings, use, feeds and speeds, grinding and cutting materials.

Using slides of his own making, the speaker showed and explained tools such as combination cutters which bore, chamfer, face and recess simultaneously. Other views depicted the world's largest cutter, a 96" diameter, inserted blade type used in cutting a 60" face on aluminum ingots. Blades of the $15,000 tool were ground out of cutter, and set in cutter body by use of an indicator.

Past Chairman Night speakers at Rochester Chapter were, from left: R. W. Weddell, of Weddell Tools, Inc., Prof. H. F. Owen, National Education Chairman; and R. B. Douglas, 1st Vice-President of the Society

Economy in upkeep, Mr. Weddell concluded, offsets the initial high cost of inserted blade cutting tools.

A coffee talk, "The Inside Dope on Sports," was given by Matt Jackson, Sports Editor of the *Rochester Times Union*.

Out-of-town Society guests who spoke briefly were R. B. Douglas, First Vice-President, of Montreal; and Prof. Halsey Owen, National Education Chairman, of Lafayette, Ind. Herbert Simon, Chapter Chairman, presided.

Dayton Has Homecoming

Dayton, Ohio—Tenth Annual Homecoming Night was observed by Dayton Chapter with a dinner meeting, May 10.

A program of professional entertainment and a brief business meeting preceded the speaking and question period.

Robert Clark and John Henshel, of the Ohio Bell Telephone Co., collaborated in an interesting presentation, "Present and Future of the Telephone."

Principal figures at a recent Evansville Chapter meeting were, from left: Roy Ackerman, Program and Entertainment Chairman; George Schad, of Carpenter Steel Co., technical speaker, and Gordon Anderson, local Carpenter Co. representative, who introduced Mr. Schad

Air-Hardened Alloys Said Less Likely to Shrink

Evansville, Ind.—George Schad, Metallurgist of the Carpenter Steel Co., Reading, Penn., outlined advantages of air-cooled tool steel at the May meeting of Evansville Chapter, held in Evansville College.

Manganese and chromium alloys that can be air-hardened, said Mr. Schad, have less tendency to break in cooling and are less likely to shrink; consequently, dimension changes are not as great as in carbon steel.

Air-cooled alloys also eliminate the necessity of cumbersome cooling mediums required with the heat-treat process. Water and oil cooling, he added, tend to increase the possibility of mistakes because heat-treat workers must be skilled. He was careful to point out, however, that air-cooled steels are not a cure-all and have definite disadvantages, depending upon prevailing conditions.

Difficulties encountered in working and hardening steels were enumerated. Using slide illustrations, the speaker discussed in detail incorrect type of steel for specific work, bar decarbonization, wrong hardening temperature, stagnant or incorrect furnace atmosphere, wrong or inadequate quenching, and overheating in grinding.

Mr. Schad was introduced by Gordon Anderson, Carpenter District Representative in the Evansville area.

Roy Ackerman, of Servel, Inc., Program and Entertainment Chairman, announced that plant tours would be arranged for the members in September.

Shows New Automatics

St. Charles, Ill.—Willard H. Spence, head of Screw Machine Sales and Tooling Applications at Brown & Sharpe Manufacturing Co., gave the principal address at a meeting of Fox River Valley Chapter, held May 4 at the Milk Pail, north of Elgin. He discussed automatic screw machines, their application and use in present day production.

Slides were shown of the 00G, 0G and 2G machines and their latest attachments, and of automatic pinion turning machines. Mr. Spence covered important primary and secondary operations performed on these machines.

L. Bowden DeForrest, Secretary of the Elgin Association of Commerce, spoke briefly following the dinner.

Tool engineers must learn to apply findings in methods engineering and time study, Stanley N. Read of Marchant Calculating Machine Co., tells Golden Gate members during recent address on industrial management

Serve Others, Serve Self Says Production Counsel

San Francisco, Calif. — "Know the one best way to do the job—the one best way to serve Management—and serve yourself." This point was brought home to 110 Golden Gate members listening to a stimulating address on "Industrial Management and Its Relation to the Tool Engineer," given lately by Stanley N. Read, Manufacturing Advisor of the Marchant Calculating Machine Co.

Management, he feels, must earn respect for leadership—it cannot be bought. Management should survey customers' needs, estimate the life of the market, establish policy as to extent of financial risk that can be ventured, and decide how the product is to be built.

Must Be Alert to New Developments

At this point it comes to the tool engineer who must design tools to give best results at lowest cost. Tool engineers, the speaker charged, have been educated along certain restricted lines in industry, but they have not learned to apply all that has been gained from time study and methods engineering.

"The tool engineer," he stressed, "must keep abreast of latest developments, create new ideas, have an organized program for new methods, new designs and new steels. Goodwill must exist between the tool engineer and the industrial engineer; assist one another and you will find the best way to achieve your goal—the management's goal."

Prior to the lecture Chairman Ernest C. Holden, who could not attend the installation meeting, received the oath of office. After being sworn in, he presented a Past Chairman pin to Floyd C. Snodgrass, retiring chairman.

Edward J. Raves, Chapter Delegate, reported on the Cleveland convention.

Coffee speaker was Judge James S. Blaine of Oakland, who related "Legal Oddities" occurring during his 23 years of legal experience.

Information pertinent to recently enacted state legislation requiring registration of engineers was presented by Dean George L. Sullivan of the University of Santa Clara.

GOOD READING

A Guide to Significant Books and Pamphlets of Interest to Tool Engineers

MODERN METALLURGY FOR ENGINEERS, by **Frank T. Sisco**, Metallurgist with Alloys of Iron Research, The Engineering Foundation, is now available in the second edition. Since the book's original appearance in 1941, there have been many advances in metallurgy and the author has done a noteworthy work of recording those developments which will have the greatest importance in tomorrow's industry.

The criticisms and suggestions of 45 college professors, who have used this book as a text, have been carefully studied and incorporated into the present edition. In addition to 452 pages of revised, authoritative text, 48 pages more of questions, bibliography, and indexing give worthy extent to the value of the volume.

The material is well-segregated for easy reference, and frequent bold-face heads call attention to the subject-matter. Numerous microphotographs, other illustrations, carefully prepared tables and charts supplement the text matter.

Several of the 23 chapters are devoted to the very important question of hardenability of metals, and others to recent developments in machinability, the use of light alloys as engineering materials, comparative corrosion resistance, and temperature effects on mechanical properties of various metals.

This widely-recognized and comprehensive textbook and reference work is available at only $5.00 per copy from *Pitman Publishing Corp'n*, 2 W. 45th St., New York.

FOREIGN TRADE HANDBOOK, edited by **Dr. E. E. Pratt**, Prof. of Foreign Trade, New York Univ., is an excellent working tool every executive engaged in export or import activities should have. It is a veritable encyclopedia on export methods and practices of today.

This most up-to-date and authoritative source of information covers, among the many other subjects: Export policies of leading American companies; selection of foreign territories for sales development; complete outline of technical procedures in foreign trade; management of foreign agents, dealers, salesmen; survey of various types of export sales outlets; services of freight forwarders, custom-house brokers, and others. Additional subjects include packaging, sales promotion, transportation, tariffs and tariff bargaining, and legal aspects.

The 1500-page Dartnell handbook may be ordered from *The Dartnell Corporation*, 4660 Ravenswood Ave., Chicago 40, at $10.00 per copy.

A HISTORICAL APPRAISAL OF MECHANICS, by **Harvey F. Girvin**, Professor of Eng'g Mechanics at Purdue Univ., is a collection of historical facts which illustrate the evolution of mechanics, upon which foundation all branches of engineering rest.

There are many who believe that the proper approach to, and complete understanding of, the engineering problems of today and of tomorrow can be greatly aided by a study of the various stages in man's quest for knowledge of how things work.

While an entirely complete history would probably run into many volumes, Mr. Girvin has collected what he considers—and, we believe, most scholars will be in accord—the more important contributions to the progress of mechanical study. We regret the woeful absence of illustrations which, when the book is used for formal study, would do much to help the student visualize the experiments made by early investigators, and appreciate the conditions under which they worked.

We like the fact that the material is not only presented in the usual chronological order but is grouped so as to present an accurate story of the development of each major scientific thought, such as the theory of dynamics or of elasticity.

This valuable 275-page history is available from the *International Textbook Co.*, Scranton, Pa., and is $3.25 per copy.

RUNNING A MACHINE SHOP, now in its second edition, was originally published only after years of research by **Fred H. Colvin** and **Frank E. Stanley**, both of whom attained prominence through their association with *The American Machinist*, and as authors, together and individually.

Although this manual remains a veritable Bible to machine shop operators, the reader should keep an open mind, realizing that so many advances have been made in industry since the book first appeared in 1941 that thorough rewriting would have meant a completely new book.

The more important influences of the war's stimulation on industry have been incorporated into a 67-page postwar supplement, which constitutes the closing chapter of the book. This supplement should, perhaps, be studied first, before reading the book proper.

Colvin and Stanley's popular book should be ordered from the *McGraw-Hill Book Co., Inc.*, 330 W. 42nd St., New York 18.

INTERNATIONAL INDUSTRY YEARBOOK, 1948, edited by **Lloyd J. Hughlett**, Managing Editor of *Ingenieria Internacional Construccion* and *Internacional Industria* is a monumental work of reporting industrial progress of the past year, both domestic and foreign.

Following a survey of the World's industrial development, country-by-country, chapters on the various branches of industry—each written by an authority active in that field—cover the principal achievements of the year in product and process development and in extension of application. Each chapter is followed by a list of references, which had served as source material in preparation of the text.

Chapters included cover the following fields: Industrial Research; Air Conditioning, Refrigeration and Heating; Cement and Rock Products; Chemicals; Communications; Compressed Air; Electrical; Electronics; Foodpacking; Glass, Porcelain and Ceramics; Industrial Design; Industrial Illlumination; Materials Handling; Physical Metallurgy; Metalworking; Mining; Industrial Packaging; Paper and Pulp Industry; Paint, Varnish and Lacquer Industries; Petroleum; Plastics; Power; Railroads; Rubber; Standardization; and Textiles.

The authors of the chapter on Metalworking—A. E. Rylander, F. W. Wilson, and C. F. Worfolk—are well known to ASTE members through their association with *The Tool Engineer* and the "Tool Engineers' Handbook".

This valuable 414-page record of industrial achievement, which should be in every technical reference library, is available from *Kristen-Browne Publishing Co., Inc.*, New York, N. Y., at $10.00 per copy.

MODERN INDUSTRIAL DIE DESIGN, by **E. A. NOWALINSKI**, ASTE member and tool and die designer for many years, describes and illustrates the design of tools for mechanical press use. Covering all the basic aspects of die design, it is applicable to everyday problems of die design and diemaking.

In addition to describing the various types of dies, the book devotes a chapter on presses and pressroom economy, also on the various modern materials for building today's dies. Many mathematical formulae, essential to good die design, are offered along with typical examples. The various drawn shapes are also described.

The paper-bound 125-page "Modern Industrial Die Design" is obtainable from *M.I.D.D. Publishing Co.*, P. O. Box 83, College Park Sta., Detroit, Mich., at $2.50 per copy.

DESIGN OF METAL CUTTING TOOLS, by **Frederic L. Woodcock**, ASTE'er and Chief Tool Engineer, Hamilton Standard Propellers Division, United Aircraft Corp'n, is a more-than-welcome addition to tool engineering literature.

Although this is a new manual, the material therein has already proven its practical value, for the author uses that technical data collected over a period of many years which has been constantly available to—and used by—members of his design staff, first with a major manufacturer of commercial cutting tools and more recently with the manufacturer of precision aeronautical equipment.

From these rules, formulae, and tabulated data, Mr. Woodcock has eliminated that which is so specialized as to be extremely limited in application, and has added such elementary information necessary for the book's use as a text in college and university classrooms. Thus, the handbook is acceptable and useful to beginner and experienced designer alike.

Provision for salvaging the tool, when its normal life on the original assignment has been expended, must be built into the original design. With frequent product changes now common in so many industries, it becomes increasingly important that the cutting tool designed for one specific job can, with minor modifications, find one or many other applications.

Adding to the fundamentals which provide the basis for complete understanding of design details are the chapters on Elements of Cutting; Maintenance, Inspection, and Sharpening; Selection of Cutting-Tool Materials; Heat Treatments; and Cutting Fluids. Individual chapters are devoted to the actual design of the various tool classifications. An Appendix provides many of the more widely-used standards tables.

For most of the tools included, a check list of required pre-design information is given. The elements of the tool are pointed out, with the more common variations described. In most instances, consideration is given to the influence of variables, and especially to that of the material being worked.

Profusely illustrated with clear, functional drawings and photographs, the 406-page "Design of Metal Cutting Tools" is available from *McGraw-Hill Book Co., Inc.*, 330 W. 42nd St., New York 18, at $5.00 per copy.

INTRODUCTION TO TOOL ENGINEERING, by **Halsey F. Owen**, ASTE'er and Associate Professor of Industrial Engineering, Purdue Univ., presents a well-balanced picture of the industrial administrative methods and procedures, which may be summed up as the "manufacturing analysis" phase of tool engineering. The material offered is attuned especially to the ultimate mass and interchangeable production of manufactured goods.

The author, in his selection of subject matter, has applied the term "tool engineering" in its broader sense, as generally agreed upon by officers and members of the ASTE, and he so defines the term in mentioning the responsibilities and qualifications of the tool engineer.

Principle subjects of discussion are Manufacturing Methods and Equipment, Methods and Parts Analysis, Operation Sheets and Bills of Material, Designing for Production, Manufacturing Costs, Tooling Programs, Economics of Tooling, Tool Design, Interchangeable Manufacture, Estimating Tool Costs.

While the techniques or details of tool design are largely left for other texts, Mr. Owen tells us how and why this subject is to be approached. The 148-page text may be ordered, at $3.60 per copy, from *Prentice-Hall, Inc.*, 70 Fifth Ave., New York 11.

QUALITY CONTROL METHODS, by **Clifford W. Kennedy**, Quality Control Engineer at Federal Products Corp'n, and frequent contributor to leading trade journals, is not "just another book on inspection methods". Recognizing the need for a text which would offer both theoretical information and practical applications, Mr. Kennedy's work should be a good beginning for a person not too familiar with the various aspects of quality control.

The author leaves little to the imagination. His basic approach to the subject, his analysis of the many factors involved, and his thoroughness in carrying the discussion onward to the more complicated systems impress the reviewer with the book's potential value.

Contents cover the usual range of statistical methods and techniques employed in quality control—sampling plans and tables, sequential and acceptance sampling; per cent defective methods; frequency distributions and deviations; average and range methods, charts, practical applications; and administration of control methods.

"Quality Control Methods", at $4.75 per copy, may be ordered from *Prentice-Hall, Inc.*, 70 Fifth Ave., New York 11.

A **COST DICTIONARY**, developed by **J. L. CARTER**, Cost Consultant to the Gray Iron Founders' Society, is designed to assist foundry accounting and clerical personnel in classifying all items of foundry expense.

More than 200 items of foundry cost, listed alphabetically, are followed by the department and title of the account to which the item should be charged, with a blank space open for insertion of the proper ledger account number by the individual foundry. A section of Supplementary Notes elaborates on the handling of certain items of cost.

The manual of cost accounting is available at $1.00 per copy from *Gray Iron Founders' Society, Inc.*, 33 Public Square Bldg., Cleveland, Ohio.

METALLURGICAL MATERIALS AND PROCESSES, by **John Elberfeld**, Dean of Engineering, Worcester Junior College, is another in the Prentice-Hall series of engineering textbooks. The author has produced a book which should be of greatest value to those persons who, while specializing in other fields, wish a general background in the science of metals.

Attention is given in the early chapters to the refining and fabrication of metals and the mechanics of materials, and considerable space is devoted to a study of grain structure and equilibrium diagrams as basic to an understanding of the effects of alloying and the physical working of metals.

The reader is also introduced to such subjects as welding metallurgy, powder metallurgy, and metallographic inspection. Advanced work in these fields are, however, left for other texts.

This 188-page illustrated text may be ordered, at $5.00 per copy, from *Prentice-Hall, Inc.*, 70 Fifth Ave., New York 11.

STARTING A SMALL MACHINE SHOP, by **Fred H. Colvin**, Editor Emeritus of AMERICAN MACHINIST, is founded on the author's rich experience gained through 60 years contact with machine shops of every size and description. This manual is the author's answer to the needs of those men with a sound shop background but as yet unacquainted with the many perplexities and problems of ownership and management.

The prospective shop-owner is told how to choose a suitable location, how to select machines and tools and other equipment, how to layout the shop, and how to design or select shop furniture. Job estimating, shop specialization, and personnel problems are also discussed.

Many time and costs saving machining methods contribute to the book's being entirely practical and helpful. Overhead constitutes a chapter in itself. This 212-page guide for the shop man starting a new enterprise is available, at $2.50 ea., from *McGraw-Hill Book Co., Inc.*, 330 W. 42nd St., New York 18, N. Y.

The **TECHNICAL PAPERS** presented at the 1948 **Pittsburgh Int'l Conference on Surface Reactions**, held last month, are available in preprint monograph form. The 28 papers offered are authored by eminent scientists and engineers from this country, England, France, Switzerland, Sweden, and Holland.

The technical program of the Conference, sponsored by the leading chemical and metallurgical societies in the Pittsburgh area, was organized around the following general subjects: Theory of Liquid Phase Reactions; Theory of Oxidation and Surface Reactions; Preparation of Surfaces; New Methods and Results; Methods and Results; Fundamental Mechanisms; and Corrosion and Its Measurement.

The preprinted papers, paper-bound, 236 pages, are available from *Corrosion Publishing Co.*, Pittsburgh 12, Pa., at $10.00 per complete book.

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Apprenticeship Programs

"Apprenticeship Credit for Previous Experience" is a report designed to serve as a guide to the solution of problems arising from apprentices desiring credit for previous experience, such as resulted from return of war veterans. Apprentice Training Service, *U. S. Department of Labor*, Washington 25, D. C.

Atmospheric Control Chambers

A complete line of units for exact simulation of temperature, altitude, and humidity is described in 32-page catalog. Units are available for varying degrees of control, and for laboratory or general industrial purposes. A valuable technical reference section is included. *Bowser, Inc.*, Refrigeration Div'n, Terryville, Conn.

Bearings, Ball

Booklet AP, "Outline of Procedure in Bearing Application," describes the fundamental steps for determining the most suitable ball bearing application design for average or general mounting conditions. Reference is made to earlier issues of this Engineering Service series. *New Departure*, Div'n of General Motors Corp'n, Bristol, Conn.

Bearings, Micro Ball

Technical bulletin No. 48, covering Micro extra-small ground ball bearings, includes design and application data on radial, angular-contact (radial thrust), self-aligning radial, and pivot types, also available in stainless steel and non-magnetic materials. *New Hampshire Ball Bearings, Inc.*, Peterborough, N. H.

Bearings, Replacement

A few of the many applications for which replacement bearings are stocked, are illustrated in Bulletin No. 5, which also lists the manufacturers represented by this distributor in the Michigan-Ohio area. *Detroit Ball Bearing Co.*, 110 W. Alexandrine, Detroit 1.

Boring and Facing Tools

Bulletin announces several additions to a line of single point tools, which have combined helical and spiral relief. Tools are available for general boring, bottoming and facing, internal threading, and in extra lengths for deeper holes. *Bokum Tool Co.*, 14775 Wildemere, Detroit 21.

Bronze Alloy Bars

Bulletin shows nominal chemical composition of the various available brass and bronze alloys, and lists stock sizes of extruded and cold drawn rectangular and square bars. *Titan Metal Mfg. Co.*, Bellefonte, Pa.

Case Histories

A collection of case histories, entitled "It Can Be Done," shows many instances of how multiple spindle screw and chucking machines and precision boring machines are achieving quality at low cost in high-production manufacture. *New Britain-Gridley Div'n*, New Britain, Conn.

Castings, Meehanite

"7 Questions and Answers About Meehanite Castings" explains just what this metal is and describes the basic characteristics of interest to industrial users of iron castings. *Meehanite Metal Corp'n*, Pershing Square Bldg., New Rochelle, N. Y.

Couplings, Flexible

Morflex flexible couplings, ranging from .06 HP to 13.80 HP per 100 RPM, are fully described in 32-page catalog No. C 41-48. Development, construction, and principle of the Morflex couplings are covered, as well as specifications and application data on the various types. *Morse Chain Co.*, 7601 Central Ave., Detroit 8.

Cutting Tools, Carbide

Revised 60-page catalog No. 646 lists the complete line of standard carbide cutting tools, including solid carbide rotary files, grooving tools, adjustable reamers, inserted tooth cutters, and other tools recently added. Machining recommendations, resharpening instructions, and other engineering data is included. *Wendt-Sonis Company*, Hannibal, Mo.

Design Service, Product

Attractive brochure "Design Increases Sales" illustrates in color a representative group of products designed by this firm, whose facilities, experience and knowledge of merchandising, materials and manufacturing techniques combine to provide an unusual service. *Barnes & Reinecke, Inc.*, 230 East Ohio, Chicago, Ill.

Diesel Engine Manufacture

"Machining and Repairing Diesel Engines," a collection of case histories, shows the use of the horizontal boring, drilling and milling machine in the successful, profitable production of diesel engine components. *Giddings & Lewis Machine Co.*, Fond du Lac, Wis.

Differentials, Mechanical

Bulletin describes high-precision calculating qualities of mechanical differentials designed specifically for the most exacting applications such as are found in Arma Naval instruments. *Arma Corporation*, 254 36th St., Brooklyn 32, N. Y.

Drill Jig Base

Drill jig permits accelerated loading and unloading by the use of air pressure for clamping between base and top plate, also automatically compensates for variations in workpiece thickness. Described in bulletin by *Industrial Clutch Corp'n*, Waukesha, Wis.

Drillers, Multi-Spindle

A 20-page bulletin offers complete information and specifications on the heavy-duty and standard H-5 and H-6 multi-spindle drillers and tappers, which permit high-speed, sensitive, multi-hole production in small parts of a wide range of materials. *The National Automatic Tool Co.*, Dept. 56, Richmond, Ind.

Drillhead, Multi-Spindle

Bulletin illustrates and presents specifications of multiple spindle drillheads, which are gear driven, with fixed and adjustable spindles. *Thriftmaster Products Corp'n*, 1048 No. Plum St., Lancaster, Pa.

Drillhead, Turret

Twelve-page bulletin No. 483 covers the Lign-O-Matic turret for drilling machines, featuring rapid automatic centering and alignment of the working turret spindle with the drill press spindle. Eliminating necessity for workpiece to be moved progressively during a sequence of operations, turret offers unusual economies and lowered operator fatigue. *Howe & Fant, Inc.*, 521 Flaxhill Rd., So. Norwalk, Conn.

Drills, Carbide-Tip Die

Pocket folder describes carbide-tip drills for drilling hardened steel in Rockwell C40 to 65 range. Annealing of hardened dies is unnecessary. Drills are available in 32nds from 3/32" to 3/4" dia. *Whitman & Barnes*, 2108 W. Fort St., Detroit 16.

Drives, Electric

Bulletin describes principal features of the V*S all-electric, infinite-speed drive, a packaged unit for transmitting power directly from a plant's a-c circuit, providing controlled acceleration and deceleration, quick and smooth starts and stops, and maintenance of proper tension for roll-fed materials. Typical applications in nine different industries are illustrated. *Reliance Electric & Eng'g Co.*, Cleveland 10, O.

End Mills

End Mills Catalog includes data on eight fast spiral styles recently added to the line—single-end and double-end; standard length, long, and extra long; ball end and two-flute styles included. All mills available in wide range of sizes. *Brown & Sharpe*, Providence 1, R. I.

Engineering Service

Annual Report summarizes research and development activities, which during 1947 affected some 300 companies, resulting in 109 patent applications in the U. S. and 50 in foreign countries. Report describes method of operation, facilities, and projects engaged in during the year. *Commonwealth Engineering Co.*, 1771 Springfield St., Dayton, O.

Fabrics, Industrial

Fiberglas and nylon fabrics for industrial uses are described in technical bulletin, which tables the characteristics of a large number of standard weaves. A wide range of applications are illustrated, including use of fiberglas with resin in providing sheet metal industries with low-cost, low pressure molded laminate tooling. *Industrial Div'n, The Duplan Corp'n*, 512 Seventh Ave., New York 18.

Flexible Shaft Machine

Bulletin describes the Speed-Right controlled speed flexible shaft machine for hand milling and grinding. Any desired speed between 1,000 and 10,000 RPM can be instantly set, and accurately maintained. *The Electro-Mechano Co.*, 261 E. Erie St., Milwaukee 2, Wis.

Gages, Thread and Plug

Catalog No. 48 provides full information on reversible "Go" and "No-Go" plug and thread gages, snap and ring gages, and thread and gear measuring wires. Included are carbide gages and centerless lapping machines, providing finish of less than 2 microinches. *Size Control Co.*, 2500 W. Washington Blvd., Chicago 12.

Grinding Machinery

Catalog No. 325 shows a complete line of coated-abrasive belt grinding, polishing, and deburring equipment, and applications. Also included are various hard wheel grinders. *Hammond Machinery Builders, Inc.*, Dept. GP-29, Kalamazoo, Mich.

Hydraulic Rings

Bulletin provides engineering recommendations for effective application of John Crane hydraulic "O" rings. *Crane Packing Co.*, 1800 Cuyler Ave., Chicago 13.

Hydraulic Tube Fittings

Bulletin covers design and application details of the Fluid Fortress no-flare and the Grip-Tube flare type fittings. Fittings feature a chrome-moly steel sleeve which insures a perfectly burnished tight seal at all times even after many repeated uncouplings of the fitting. Fittings are claimed to absorb excessive vibration, seal pressures beyond bursting capacity of the tube, and prevent twisting of tube during installation. *Flodar Corp'n*, 331 Frankfort Ave., Cleveland, O.

Inventory Control Systems

"How to Get Profits from Inventories," a 24-page booklet, shows why and how improved modern inventory records reduce clerical costs, simplify supervision, prevent overstocking problems and those arising from unexpected shortage of stock, and provide other advantages. Systems and Methods Research Dept., *Remington Rand Inc.*, 315 Fourth Ave., New York 10.

Lathe Tools, Ejector-Type

Application manual covers 20 styles of ejector-type tools, using solid carbide replaceable inserts, and illustrates many typical applications. Inserts are available in a wide range of carbide grades, made by Carboloy, Kennametal, Firthite, or Vascaloy-Ramet. *Super Tool Co.*, 21650 Hoover Rd., Detroit.

Lathes, Finishing

A 32-page catalog (No. 480) presents the complete line of speed lathes designed for secondary finishing operations on small metal and plastic parts. Complete descriptions of the many types and sizes of lathes are included, with details of their applications for polishing, lapping, filing and de-burring. *The Schauer Machine Co.*, Cincinnati, O.

Lathes, Precision

Bulletin WE-59 lists specifications and describes principal features of the high speed precision lathe with variable speed (90 to 3400 RPM) drive, complete with 2-speed reversing motor. *Hardinge Brothers, Inc.*, Elmira, N. Y.

Marking Equipment

Eight-page bulletin offers 18 marking and code-dating machines, including several recent models, for imprinting, indenting, embossing, etching and hot-stamping all kinds of containers, labels, parts and products. Some are automatic and designed for production line use. *Adolph Gottscho, Inc.*, 1 Hudson St., New York 13.

Metal Processing

The activities of various metal processing, engineering, and fabricating divisions are reported in attractive 20-page booklet, "Metal for Industry." *Continental-United Industries Co., Inc.*, 345 Madison Ave., New York 17.

Milling Chucks, Magnetic

"Holding for Milling" illustrates use of Power-Grip chucks in holding shafts and castings for production milling, reducing loading and unloading time to a bare minimum. Use of chuck for diversified tool room work is also described. *Rockford Magnetic Products Co., Inc.*, 1826 Ninth St., Rockford, Ill.

Mills, Midget

Pocket folder No. 641 presents information on ground-from-the-solid midget mills of high speed steel and cemented carbide. Typical uses are mentioned. *Severance Tool Industries, Inc.*, Saginaw, Mich.

Motors, Electric Geared

Colorful 16-page brochure presents the latest models of U. S. Syncrogear motors, offering single, double, and triple reductions and for use in Varidrive units. Functional drawings, cutaway views, and other illustrations show exact construction, operating features, and use of motors. *U. S. Electrical Motors, Inc.*, 200 E. Slauson Ave., Los Angeles 54.

Mounted Wheels and Points

Folder features standard line of mounted wheels and points, produced from solid blocks of mixed abrasive and bond, and trued and shaped on the corrosive resistant deep-knurled steel mandrel. *Bay State Abrasive Products Co.*, Westboro, Mass.

Name Plates

Pamphlet, first in a series, stresses the importance of the product name plate as an advertising medium. General information on available design, lettering, shapes, sizes, metals, colors, and finishes are given. *American Name Plate Co.*, 4242 W. Arthington St., Chicago 24, Ill.

Polishing Wheels

Folder lists standard sizes of felt wheels and cones, bristle brush wheels and cups, leather discs, and other polishing supplies carried in stock. *W. F. Bollen Co.*, 1 E. 42nd St., New York 17.

Presses, Arbor

Twenty-page catalog No. 40 describes an extensive line of hydraulic and hand-operated arbor presses, which have evolved from the first arbor press made in 1883. *Greenerd Arbor Press Co.*, Nashua, N. H.

Presses, Hydraulic

A 16-page catalog gives full details and specifications on hydraulic presses—straight side, post, and special types—ranging from 75 to 5000-ton capacity. Detailed description of the "Hydrol" speed circuit, which minimizes high pressure piping and valving, is included. *Verson Allsteel Press Co.*, 9300 S. Kenwood Ave., Chicago 19.

Projector, Micro

Wilder micro projectors, available in two models, make possible fast and positive inspection of precision parts. Six-page folder describes both models, their application, and the use of accessories. *George Scherr Co., Inc.*, 200 Lafayette St., New York 12.

Reamers, Adjustable Blade

Bulletin combines descriptive information and catalog data on the Camlock adjustable serrated blade shell reamers, for accurate production reaming under severe conditions. *Pratt & Whitney*, West Hartford 1, Conn.

Recessing Tools, Automatic

A line of standard automatic recessing tools for precision recessing, undercutting, grooving, necking, and facing is fully covered in 28-page Manual No. 17-2, which also incorporates design features, diagrammatic explanations of use, application and production data, and other information. *Scully-Jones and Co.*, 1901 So. Rockwell St., Chicago 8, Ill.

Saws, Metal Cutting Band

Pocket booklet offers recommendations on use of band saws in foundry work, cutting bar stock, contour cutting, and friction cutting, and describes the band saws available. *The Atlantic Saw Mfg. Co.*, New Haven, Conn.

Sheet Metal Fabricator

Outstanding features of the versatile sheet metal fabricator, with Hydra-New-Matic drive, are illustrated in 12-page bulletin. Fabricator punches, notches, nibbles, bends, blanks and forms. Complete sets of graduated interchangeable punches and dies are within an arm's reach on revolving turret stand. *Wales-Strippit Corp'n*, No. Tonawanda, N. Y.

Steel, Improved Bar

Bulletin describes improved Ry-Ax hot rolled, heat treated bar steel. Mechanical properties, hardness readings and machinability rating of these machine straightened bars are given, and typical shafting and axle applications are illustrated. *Joseph T. Ryerson & Son, Inc.*, Box 8000-A, Chicago 80.

Steel, Stainless

A 32-page booklet, "Stainless Plates and Their Fabrication," supplies valuable data on the selection and fabrication of solid stainless steel and stainless clad plates, used alone or in combination. *Allegheny Ludlum Steel Corp'n*, Pittsburgh 22, Pa.

Steel Selector, Tool

Handy chart provides ready information on characteristics, chemical analysis, and heat treating requirements of the many standard tool steels, including hollow (tubular) die steels. *A. Milne & Co.*, 745 Washington St., New York 14.

Tap Handbook

An 18-page book on heavy oil-resistant stock opens flat at any page, offering ready information on selection of taps, basic thread dimensions and tap drill sizes, suggested speeds, lubricants and angle of cutting edge for tapping various materials, sharpening hints, and definitions of tap terms. *Charles H. Besly & Co.*, 118-124 N. Clinton St., Chicago 6.

Taps, Special

Pocket folder, "Cures for Threadaches," announces taps built to order, from blueprint or sample, and availability of engineering assistance on unusual thread-cutting problems. *Hy-Pro Tool Co.*, New Bedford, Mass.

Tool and Die Accessories

Catalog covers line of Standard socket cap and set screws, pressure pad stripper and knock-out springs, hardened and ground dowel pins, and other components. *Standard Machinery Co.*, Providence 7, R. I.

Transmissions

Four-page bulletin features transmissions up to 30 HP for conversion of cone driven machine tools. Adapted to plate or platform mounting, transmissions are available in 8 speed changes. *Western Mfg. Co.*, 3400 Scotten Ave., Detroit 10.

Tubing, Flexible Steel

Catalog of 24 pages fully describes the all-metal flexible tubing, available in brass for the usual applications or in bronze for nominal steam pressure, in monel and stainless steel for higher temperatures and corrosion resistance, and in inconel for extremely high temp. Allied products are also included. *Titeflex, Inc.*, 641 Frelinghuysen Ave., Newark 5, N. J.

Welder, Arc

Catalog sheet gives complete specifications and data on the Nu-Arc general purpose a-c. arc welder, featuring simplified construction, high efficiency, low maintenance, and portability. *Electric Arc, Inc.*, 152-162 Jelliff Ave., Newark 8, N. J.

Welder, Resistance

Tri-phase balanced power load is a feature of the resistance welders described in bulletin. Flexibility and versatility of machines, improved weldability, and accessibility of equipment are other highlights. *The Taylor-Winfield Corp'n*, Warren, O.

Welding Guns

A 12-page bulletin No. 402 describes and illustrates how welding guns are custom-built by combining standardized and interchangeable components as required. Bulletin claims that as many as 57,600 gun assemblies can be produced using but one gun chassis, and there are five basic types of gun chassis available. *Progressive Welder Co.*, 3050 E. Outer Drive, Detroit 12.

Welding Rods, Low-Temp

"Here Is Your Information" presents concise factual information on the more commonly used low-temperature rods, listing those rods designed specifically for each metal application. *Eutectic Welding Alloys Corp'n*, 40 Worth St., New York 13.

North East West South
IN INDUSTRY

The Reed Rolled Thread Die Co., of Worcester, Mass., has acquired **The Cleveland Die & Mfg. Co.**, Cleveland, O., said to be the oldest commercial manufacturer of thread rolling dies. **Henry Bockelman**, who founded the Cleveland firm, will manage the Cleveland plant until it is moved to Worcester, after which he will act as a consultant to the Reed organization.

E. M. Griffith

J. J. Stephens

J. J. Stephens, vice-pres., treas., and gen'l mgr. of **Strong, Carlisle & Hammond Co.**, has been elected President of the Cleveland mill supply firm.

Edward M. Griffith, who has held key positions in Cuyahoga Steel and Wire, Union Drawn Steel, and Defiance Pressed Steel, was recently appointed Executive Vice-Pres. of Jessop Steel Co., Washington, Pa.

The **Johansson Gage Division** of the **Ford Motor Co.** has been sold to **Brown & Sharpe Mfg. Co.**, Providence, R. I. **Henry Ford II** stated that, after careful consideration, it was felt that the Brown & Sharpe 115 years of experience in building precision tools and the firm's excellent standing in the industry offer the necessary skill and background essential to carrying on the Johansson tradition of quality. Reportedly, the available stock of gage blocks is sufficient to meet industry's needs until equipment and special steel stocks have been transferred to Providence and production is resumed.

Carborundum Company, Niagara Falls, N. Y., has awarded **Chemical Plants Div'n of Blaw-Knox Co.** the contract for construction of an abrasive furnace plant at Vancouver, Wash. The Blaw-Knox award involves approximately $2,500,000 and covers a major portion of the project.

The **Interstate Mfg. Corp'n**, Orange, Conn., has purchased the **Cochrane-Bly Co.**, Honeoye Falls, N. Y. Equipment and key personnel are being transferred to the Orange plant where facilities permit greater production of the Cochrane-Bly vertical miller shaper, cold-cutting saws, and saw sharpeners.

Cosa Corporation announces its appointment as Canadian representative for a number of the Swiss lines of high precision machine tools and measuring instruments that it now handles in the United States. These manufacturers include Societe Genevoise D'Instruments, Andre Bechler, Friedrich Gygi, and Sallaz Freres. Inquiries should be addressed to **Milton D. Thalberg**, Sales Mgr., at 405 Lexington Ave., New York 17.

Jeffreys Engineering & Equipment Co., specializing in sales and engineering of metalworking equipment and machine tools, has moved from Raleigh, N. C., to offices in the Guilford Bldg., Greensboro, N. C.

H. Freden, formerly Dean of Engineering at Detroit College of Applied Science, and prominent in the tool and production fields, has been elected Vice-Pres. of **Aero-Nat Tool & Die Co.** of which **N. Nordin** is Pres. Aero-Nat has taken over the heavy machinery and tools division of the **Giern & Anholtt Tool Co.**, 1308 Mt. Elliott, Detroit.

R. J. Nadherny

E. H. Lenz

Russell J. Nadherny, who has been Ch'f Eng'r and previously held important engineering positions at Athey Products Corp'n and the Mercury Mfg. Co., was recently elected Executive Vice-Pres. and Director of Eng'g and Production for **Barnes and Reinecke, Inc.**, Chicago.

Earl H. Lenz has been appointed Director of Eng'g for **Twin Coach Co.**, Kent, O. Previously production mgr. for Curtiss-Wright Corp'n in Buffalo, Mr. Lenz joined Twin Coach about two years ago.

Morse Chain Company, Detroit, announces the appointment of **D. C. McNeely** as Mgr. of the Morse-Rockford Sales Div'n to handle the marketing of the recently-developed line of industrial friction clutches.

Pioneer Pump and Mfg. Co., Detroit, announces the appointment of **J. Ralph Griffith** as Sales Mgr. Mr. Griffith was formerly sales mgr. of Drive-All Mfg. Co.

The **Austin Company** has been awarded contracts for construction of the $2,500,000 completely new plant at 40600 Plymouth Rd., Plymouth, Mich., for the **Whitman & Barnes Div'n** of the **United Drill & Tool Corp'n.**

Formerly a G-E affiliated company, **The Elmira Foundry Company, Inc.**, Elmira, N. Y., has been dissolved as a corporation, the foundry becoming an integral part of the **General Electric Company's** Apparatus Department.

Service Machinery Co., 2832 E. Grand Blvd., Detroit 11, recently-named national sales agent for **Knox Industries, Inc.**, is seeking representatives in various territories to handle the Air-Miser 4-way by-pass air valve.

James Giern and **Anders Anholtt** have organized a new company—the **Gatco Rotary Bushing Co.**—for the manufacture of rotary bushings only, to be located at 1300 Mt. Eliott, Detroit. The former Giern & Anholtt plant has been taken over by the **Aero-Nat Tool & Die Co.**

The Wickman Mfg. Co. has been formed to take over from **The Wickman Corp'n** the manufacture and sale of diamond wheels and related products. Headquarters will remain at 15533 Woodrow Wilson, Detroit.

The **Hauser Machine Tool Corp.**, 74 Bournedale Rd. No., Manhasset, N. Y., has been organized to distribute in the United States the complete line of Swiss jig boring machines and optical measuring machines manufactured by **Hauser, Ltd.** of Switzerland. Principals in the new firm are Pres. **Carl Hirschmann**, Bienne, Switzerland; Sec'y **Gilbert L. Dannehower**, who introduced the Johansson Gage Blocks in the USA; and Treas., **Walter S. Ryan**, formerly Michigan and Ohio representative for the Swiss SIP jig boring machines.

The **Tocco Div'n** of **The Ohio Crankshaft Co.**, Cleveland, O., has opened offices at 1300 E. Nine-Mile Rd., Detroit 20, to provide complete engineering, sales and service facilities covering all phases of induction heating. The Detroit staff is under the direction of ASTE'er **W. K. Ginman**, formerly with the Budd Company's Induction Heating Div'n, which was purchased by Tocco early in the year.

Metal Cutting Tools and Mfg. Co., Berkley, Mich., will hereafter be operated as Fuller Tool Co., each department being headed by one of the six Fuller brothers. There is no change in policy, personnel, or address.

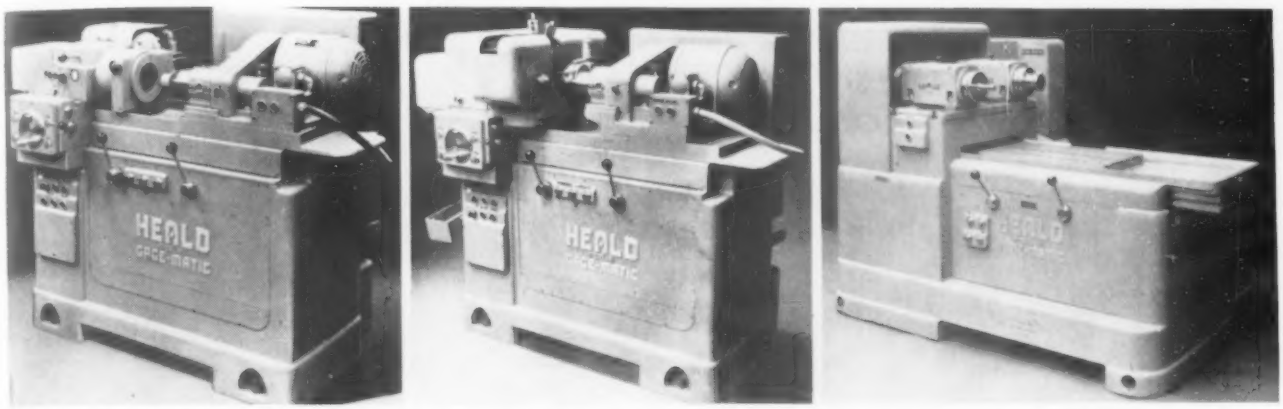
COMING EVENTS

Sept. 13-17. AMERICAN INSTRUMENT FAIR and Conference, sponsored by Instrument Society of America. Convention Hall, Philadelphia.

Oct. 25. 30th NATIONAL METAL CONGRESS and EXPOSITION, sponsored by American Society for Metals. Convention Hall, Philadelphia.

TOOLS OF TODAY

Precision Machines Announced by Heald



At left, the Heald Model 171 internal chucking grinder; at center, the Model 181 centerless grinder; and at right, the Model 421 single end Bore-Matic. The Model 422 Bore-Matic is largely similar except that it has opposed boring heads.

Heald Machine Company, Worcester 6, Mass., has added several machines to its line of precision finishing equipment. These include an internal Chucking Type Grinder—Model 171; a fully automatic centerless type Internal Grinder—Model 181; and two Bore-Matics, Models 421 and 422.

Both grinders are specifically designed for small work—2" O.D. for the 171 and 4" O.D. for the 481—and large lot production, and both are available with automatic sizing. In addition, the machines feature controlled diminishing feed, from roughing through finishing, at pre-set rate, faster cycles and quicker setups, convenient controls and a compact wheel dresser.

The 421 Borematic is single end; its companion Model 422 double end. Both are designed for mass production on precision work requiring several operations, or for single or multiple operations on several parts simultaneously.

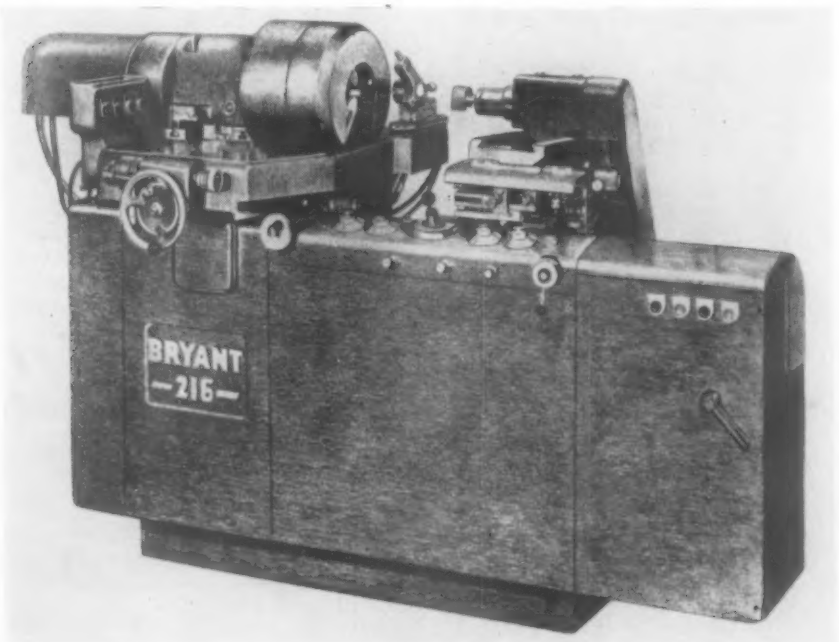
These machines feature high production cycles, ample power for roughing, permanently lubricated boring heads and a low temperature hydraulic system providing uniform hydraulic feeds. Operation is convenient with fast automatic cycles and smooth table operations. All rotating tools are the same hand, and simple control sections provide different rates of "in" and "out" feeds when two-way boring is desired.

T-7-1

Hydraulic Internal Grinders

A precision high production Internal Grinder, by Bryant Chucking Grinder Company, Springfield, Vt., is designed for automatic operation. One operator may operate one or several machines.

The various movements are hydraulically operated for flexibility between the several units, with cycle control accomplished electrically so that cycle can be readily changed to suit varying working conditions. The methods of automatic sizing are provided, the basic machine being equipped so that change-over from one method to another may be effected by the mere addition of the desired sizing equipment.



Sizing from the diamond is accomplished by grinding a predetermined amount beyond the wheel truing positions, compensation for wheel wear being automatic. For automatic plug sizing, a plug gage mounted on the work spindle automatically checks the bore size after each pass and the machine automatically stops grinding and the wheel withdraws from the bore, ready for loading the next workpiece. A third method employs a diamond tipped finger which operates electrical contacts to arrest grinding and to withdraw the wheel.

The machine has 16" swing inside the water guard and has a 15" total wheel slide traverse. Tapers may be ground up to 60° included angle and, for smaller bores, Bryant high frequency spindles operating up to 100,000 RPM may be used.

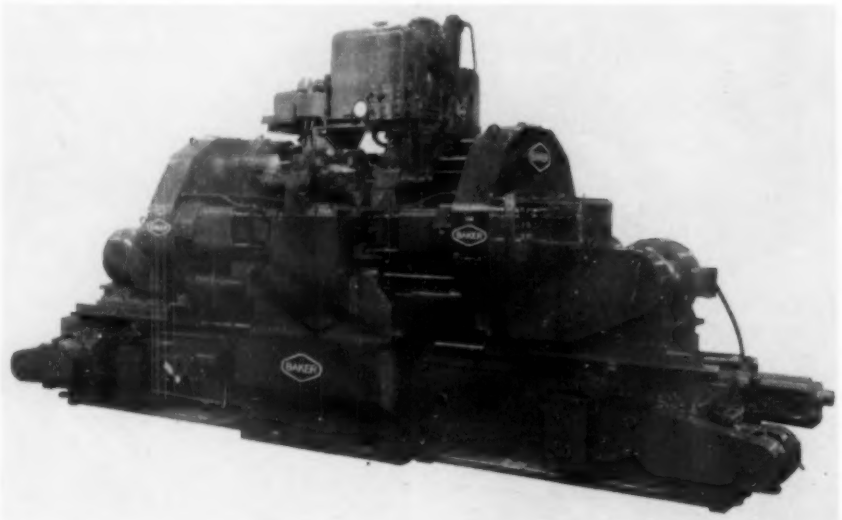
T-7-2

Multi-Operation Machine

A 6-station Multi-Operation Machine, by Baker Brothers, Inc., Toledo, Ohio, is designed for drilling, boring, reaming, counterboring and tapping operations on automobile front wheel spindle supports. Parts are transferred, by an automatic indexing trunnion, from loading through the five machining stations.

Location, at each of the indexing stations, is provided first by a shot pin, with positive alignment by guide bars that move in with the right and left hand units. Clamping and unclamping one right and one left hand part, at each station, is through a separate hydraulically operated clamping unit. Self contained coolant pumps provide cascade lubrication.

Components include two standard Baker model $3\frac{1}{2}$ x 24 floor type hydraulic feed units, with auxiliary model 3 x 12 hydraulic feed units equipped with a 4-spindle head for tap drilling and tapping four small cross holes. **T-7-3**

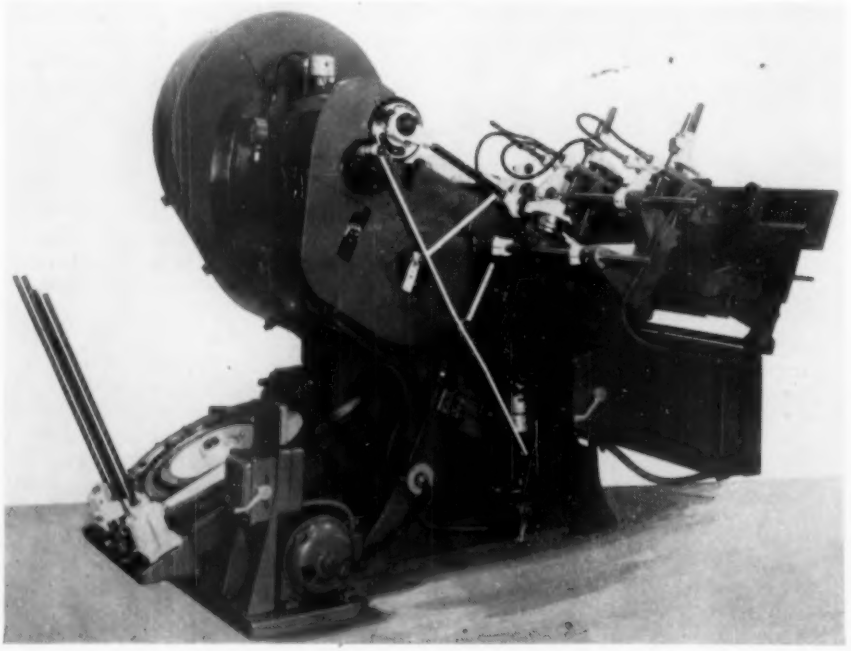


Strip Feed Press

An automatic Strip Feed Press, introduced to the can making industry and designed for medium and high speed production, is now available for either single or double dies, or for multiple die work with special slides.

Built by Lima-Hamilton Corporation's Hooven, Owens, Rentschler Co. division at Hamilton, Ohio, this press—of 25-ton capacity—is said to operate successfully at 225 strokes per minute, with provision for even higher speeds.

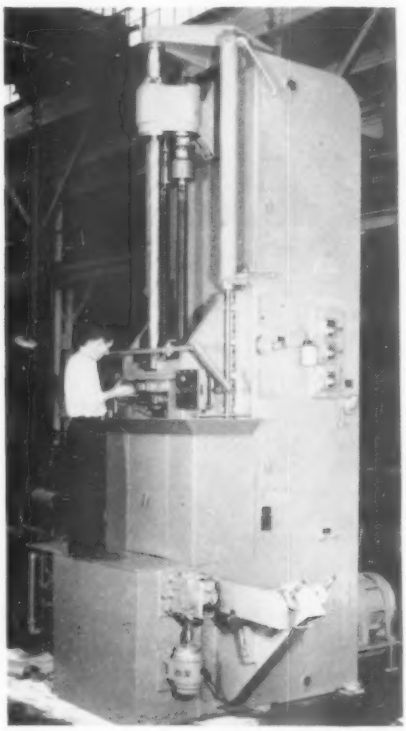
Named Model 301, this press incorporates numerous safety features, both as regards operators and press mechanism. An electric timer stops the press at the top of the stroke; furthermore, the clutch is automatically disengaged upon operation of any of the safety devices. Electric stops are also furnished for "doubles" or for jams in feed and scrap ejection rolls. **T-7-4**



Hydraulic Broaching Machine

A large type vertical pull-up internal hydraulic Broaching Machine, by American Broach & Machine Co., Ann Arbor, Mich., has an overall height of 16'-10" with a normal operating capacity of 30 tons and a broaching stroke of 60". The machine is designed to broach involute splines in gear blanks.

Features include a helix lead and nut bar, for driving the broaches during the pulling stroke, and a lower guide which not only raises the broaches to the pull heads but also continues upward to provide large broaches with additional alignment during the broaching stroke.



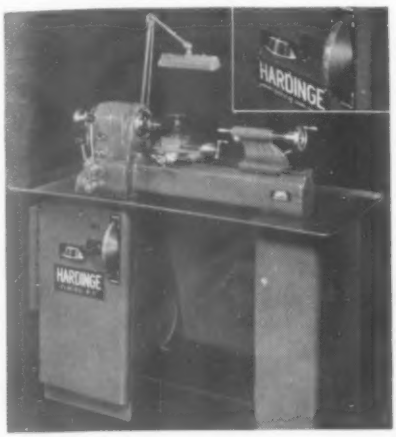
All operating cycles are electrically interlocked as a safety measure for operator and machine mechanism. One complete cycle produces two parts, which are first loaded into a slide (seen just below the operator's band) while the broaches rest in the lower guide.

The slide is pushed into position, and the push buttons are depressed to start the machine cycle. The broaches are then raised until the shank ends coming through the workpieces are connected in the automatic broach pull heads. The machine ram then starts the broaching stroke and the lower guide continues up until the broach reaches top of cycle, when the operator unloads the workpieces and starts the main slide on the return stroke.

Normally, a machine of this type is installed in a pit, with a chip conveyor for removing excess chips which may accumulate in the coolant reservoir, and with the operator's platform at floor level. **T-7-5**

High Speed Precision Lathe

Designed for working to extremely close tolerances, the WE-59 High Speed Precision Lathe, by Hardinge Brothers, Inc., Elmira, N. Y., incorporates such modern features as hardened and ground steel bed ways of improved dovetail design. The ways form a solid bed top which protects the accurate angular ways. The lathe further rests on a 3-point mounting, on a welded steel pedestal base, to insure original bed accuracy when the machine is placed on an uneven floor.



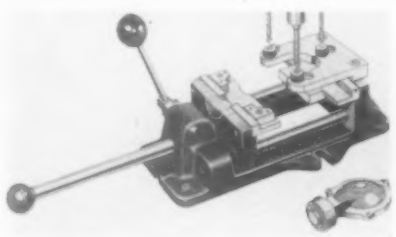
A preloaded ball bearing spindle, in a fully enclosed head, takes 1" capacity 5C Hardinge collets and 6" capacity step chucks. Center-drive belts, easily replaced, are located between the spindle bearings for balanced bearing spread and equal distribution of belt pull.

The compound slide rest is securely anchored to the dovetail ways by a patented lock which affords rapid positioning. The index slide swivels 360°, while 2" diameter feed screw dials are graduated for direct reading in thousandths. The variable speed drive, with controls within easy reach, provides infinite speed range from 90 to 3500 RPM. **T-7-6**

"Gripmaster" Vise

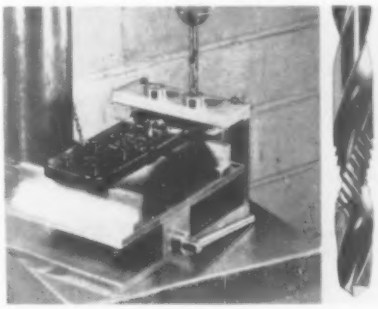
A quick acting vise—the "Gripmaster," by National Machine Tool Corp'n, 1214 Sixteenth St., Racine, Wis.—can be used as a base structure for drill jigs and fixtures, as suggested by the setup in the photo.

The jaws close and open by push-pull of the center bar with final, effortless clamping by ball-handle locking lever. Accessories, outside of specially designed bushing plates and jaws, include built-in parallels and V-blocks. **T-7-7**



High Speed Drill Reamers

Drilling and reaming in one continuous stroke is now possible with the High Speed Drill-Reamers announced by Severance Tool Industries, Inc., Saginaw, Mich., and now offered in 5 standard sizes—3/16", ¼", ⅜", ½" and 9/16" diameters.



The drill section of these tools provides for efficient drilling, through materials of any thickness up to that equalling their diameter, with liberal allowance for grinding the drill point a number of times. The reamer section is designed with teeth of unusual shearing qualities and arranged to preclude chatter and to expel the fine "wool-like" chips into the main flutes of the tool.

The tools are best suited for short, thru holes where the drilling function is completed before the reamer section begins to finish. Drill-Reamers having longer-than-standard pilot drills are furnished to order for thicker materials: also, solid carbide are furnished to order when required. **T-7-8**

Mikrokator by Swedish Gage

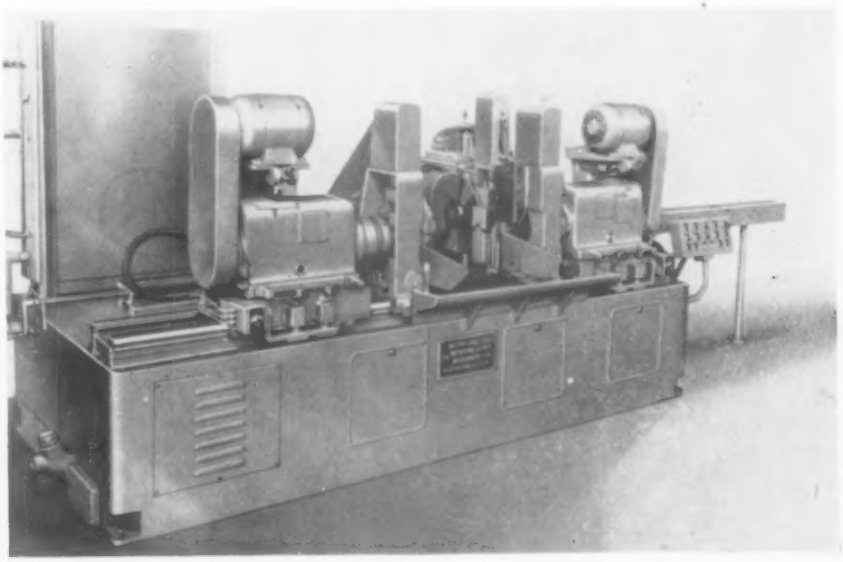
A measuring instrument by the Swedish Gage Company of America, 8900 Alpine, Detroit 4, is designed for checking out-of-roundness and diameters of cylindrical parts. Called the Ridermikrokator, the instrument can be used to advantage for checking centerless ground parts.

The measure head is a standard Mickrokator No. 220, which is locked into the frame. Angle between the anvils is 60°; thus, the difference in radius between the setting gage and the work is measured, and the tolerance pointers should therefore be positioned only to half the limits required. **T-7-9**

Transfer Machines by M & M

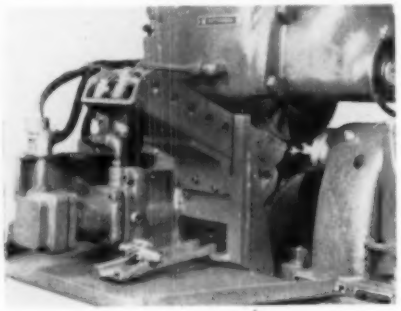
Motch & Merryweather Machinery Company, 715 Penton Bldg., Cleveland 13, Ohio, offers a line of four "D-E" (double end) Transfer Machines with unique characteristics. In these machines, the workpiece is sawed to length and quickly transferred to position for machining both ends while the next piece is being cut off.

Standard bar stock is fed automatically, cut off with ends square ± .001" and to length ± .004". It is then automatically transferred to equalizing jaws for accurate, double end machining, viz: chamfering, center drilling, threading both ends, trepaning and/or turning one or both ends on bar stock. Comparable operations, plus reaming, can be done on tubing. **T-7-10**



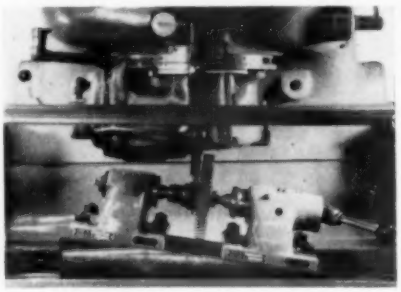
Gear Shaving Developments

An automatic loading mechanism, developed by National Broach & Machine Company, 5600 St. Jean Ave., Detroit 13, for use with Red Ring Diagonal Gear Shaving Machines Models GCV and GCU, permits the machines to run continuously as long as the magazines are supplied with work gears.



Automatic loading, as developed for continuous automatic cycle gear shaving. Work gears are fed into position and discharged by gravity chutes.

The loader operates as follows: With head and tailstocks retracted, the loader moves forward, meshing work gear and cutter. Head and tailstocks advance, clamping the workpiece in shaving position. The loader moves back to the magazine to pick up another work gear, and shaving starts. Shaving completed, the head and tailstocks retract, when the shaved gear drops onto unloading rails which carry it away by gravity. The cycle repeats, continuous without stopping.



Tipping a work gear and employing a conical involute cutter permits shaving shoulder gears with limited clearances.

Another development, by National Broach & Machine, is shaving of close shoulder gears. In shaving by the rotary crossed axis principle the difficulty varies inversely with the amount of clearance available. Thus, with very small clearance, the angle between the axis of cutter and work gear may become so restricted that cutting action is seriously reduced and machining time greatly increased.

By developing a conical involute cutter and tipping the work away from it, there is provided sufficient angle to obtain the desired clearance the while attaining excellent cutting action with decreased machining time. The method is applicable to open and helical gears, or to teeth which are tapered away from or toward the shoulder gear.

T-7-11

Use This Coupon for Complete Information on Tools of Today Items Featured This Month

Tools of Today Department, THE TOOL ENGINEER
550 West Lafayette Blvd., Detroit 26, Michigan

Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-7-1	T-7-2	T-7-3	T-7-4	T-7-5	T-7-6	T-7-7	T-7-8	T-7-9
T-7-10	T-7-11	T-7-12	T-7-13	T-7-14	T-7-15	T-7-16	T-7-17	T-7-18
T-7-19	T-7-20	T-7-21	T-7-22	T-7-23	T-7-24	T-7-25	T-7-26	T-7-27
T-7-28	T-7-29	T-7-30	T-7-31	T-7-32	T-7-33	T-7-34	T-7-35	

Name.....

Position.....

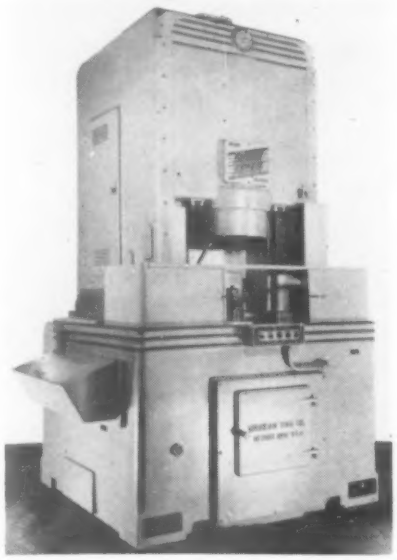
Firm.....

Street.....

City..... State.....

External Gear Shaper

A larger Shear-Speed external shaper Model 18103—capable of cutting all teeth simultaneously in gears, toothed clutches and other external shapes up to 10" O. D. and 2¾" (maximum stroke) thickness has been added to the Shear-Speed line by Michigan Tool Company, 7171 E. McNichols Road, Detroit 12.



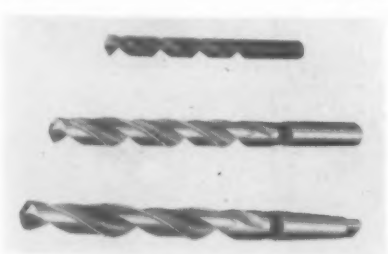
While recommended by the maker for gears or involute splines from 5 to 12 pitch, it will also cut straight sided splines, sliding clutches, ratchets, inverted splines and other external shapes, individually or stacked in multiple units depending on nature of the work.

A feature of the 18103 (now being applied to other Shear-Speed models) is a unique method of automatically locking the head in cutting position, thus reducing the time required for adjusting vertical cutting position to a minimum.

As an example of its productive capacity, it is claimed that the entire machine time cycle for the gear shown in place—47 teeth, 5.885 pitch, depth of tooth .304", 1¼" wide—was only 52 seconds. **T-7-12**

Super Adds Taper Shanks

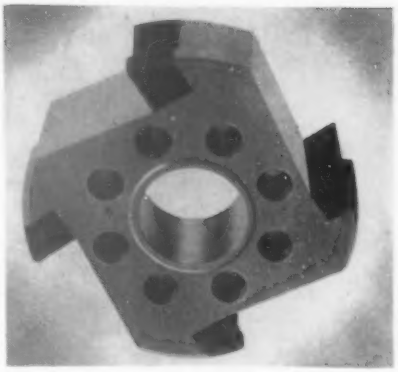
In line with a revision of their twist drill setup, Super Tool Company, 21650 Hoover Rd., Detroit 13, has added taper shanks to their standard line of Carbide Tipped Twist Drills. These taper shanked drills are now available in the same sizes as straight shank—i.e., ⅛" to 1". **T-7-13**



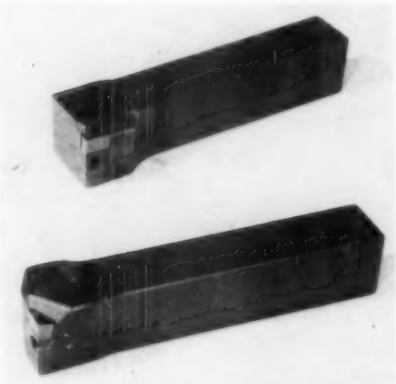
Carbide-Tipped Tool

The R. F. Cook Manufacturing Company, 2732 Second Street, Cuyahoga Falls 19, Ohio, has extended its standard line of circular carbide-tipped Cutting Tools to include a shape capable of performing turning and single chamfering operations. This tool is similar to other tools in the same line in that it incorporates four individual cutting edges and each tool can be used through all four cutting positions before machine must be stopped for tool resharpening. This feature greatly reduces machine down-time.

This carbide-tipped tool can be used on any type of automatic, and is held in manner similar to high speed steel tools of the same type. **T-7-14**



Wedge-Lock Tool Holders



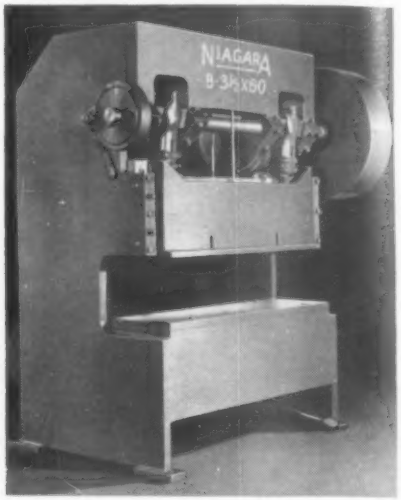
A complete line of turning and facing tools, by Viking Tool Company, Shelton, Conn., embodies a hardened semi-cylindrical wedge-type lock, for inserted carbide tool bits, which provides rigidity and long tool life and which is said to make practical extremely heavy cuts with the carbide bits.

The tool holders are available in a number of styles and are provided with built-in chip breakers which obviate ground-in chip breakers on the inserts. The tools are stocked in standard shank sizes from ¾" to 2" tool heights—straight, for shoulder work; 15° nose angle, for roughing; offset, for close chuck work; and offset facing, for facing operations. **T-7-15**

Gap Frame Presses

A line of Gap Frame Double Crank Presses, by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo 11, N. Y., combines the convenience of a "C" frame and the width and stability of the double crank press.

Designed with short stroke, rigid box crown and a deep bed, these presses are particularly suited to fine blanking dies and for forming work requiring heavy load at the bottom of the stroke.



Long or irregular sheets and strips can be fed either front to back or right to left, as the bed is equally accessible. On geared presses, the back shaft does not cross the press, but is mounted in anti-friction bearings and entirely supported by the right hand upright. The pinion, also supported between anti-friction bearings, holds the back shaft in true alignment with the main gear.

Other features include a welded all-steel frame and slide, the Niagara 14-point engagement sleeve clutch, anti-friction bearings in the clutch wheel, air counterbalance for slide, and a compensating and indicating brake. The presses are built in seven sizes ranging in capacity from 44 to 244 tons and the machines in each size are made in five to six widths to handle work requiring a wide range of capacity and bed area. **T-7-16**

"Tipt-Type" Sapphire Gage

Plug gages by the Sapphire Products Division of Elgin National Watch Company, Aurora, Ill., are now available with hardened steel leaders to protect the sapphire gaging member. The steel tips are bonded to the sapphire tip after the latter has been metalized by an Elgin process.

Sizes of these gages, which are provided with a flexible handle, range from .020" to 1.000". Since the sapphire member is approximately ¼" long, the steel tips and body behind the sapphire permit manufacture of extra length gages at only nominal costs. **T-7-17**

Portable Power Unit

A completely separate mobile hydraulic Pump and Tank Unit recently introduced by Baker Brothers, Inc., Toledo, Ohio, for use with hydraulic feed way type units, is said to include all the advantages of the permanent type hydraulic system in addition to utilities provided by location outside the machine base. Advantages include ready exchangeability of units, whenever desirable, together with smoother machine operation through more efficient cooling of the hydraulic fluid.

The unit, which uses the recently developed Oilgear model JK10203 variable delivery feed pump of the positive displacement, variable delivery, radial piston type, is attached to the operating cylinder of machines by high pressure hose lines joined with self-sealing couplings that permit breaking the line without influx of air into the hydraulic system. Whenever service to the hydraulic system is necessary, a fast switch of power units may be made by merely disconnecting the two high pressure hose lines, and connecting a replacement power unit to the machine.

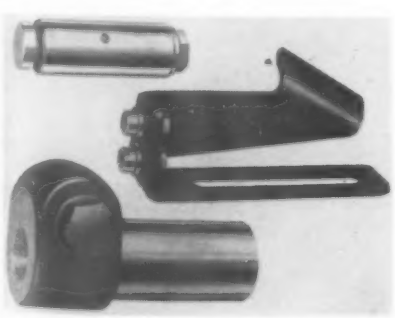
T-7-18

Screw Machine Tools by B & S

Several new items, added to the line of screw machine tools and accessories by Brown & Sharpe Mfg. Co., Providence 1, R. I., include revolving Stock Stops for turrets Nos. 00 short, 00A long, 20 short, 20A long, 22 short and 22A long (shown at top in montage); a Closer for self opening die holders (shown at right); and turret tool Adaptors (at bottom).

The latter permit the use of screw machine tools in larger machines than those for which the tools were designed; thus, tools that might otherwise be inactive can be used on work requiring additional or duplicate tools.

T-7-19



Portable Pneumatic Tools

A group of Pneumatic Tools, known as the "Stream-Power" line and recently introduced by Buckeye Tools Corp'n, Dayton 1, Ohio, includes the following basic tools with several models in each classification:

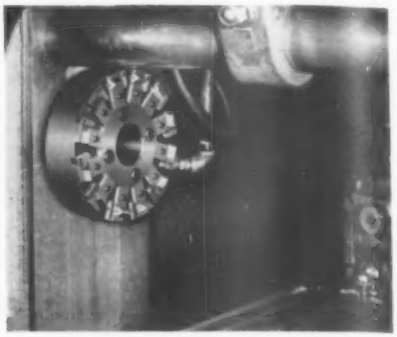
Horizontal grinders with speed range 3000 to 22,000 RPM, weighing 1 to 12 lbs. and in capacities ½" to 8" wheel diameter. Vertical grinders and sanders with speeds 3000 to 6000 RPM, weight 10 to 12 lbs. and with grinding wheel capacities 4" to 6" diameter and sanding pad diameters from 5" to 9".

Nibblers for up to 20-gauge maximum capacity; air wrenches with up to ⅝" nut capacities; and shears with up to 14-gauge maximum capacity. The model shown—a "Stream-Power" Pneumatic Shear—weighs 5⅝ lbs. and is 9½" long.

T-7-20

Carbide-Insert Milling Cutter

A Milling Cutter, announced by Diamond-Detroit, Inc., General Motors Bldg., Detroit, employs the use of solid triangular carbide inserts which can be quickly adjusted or substituted in the cutter head while the latter is in milling position. When a blade becomes dull, it is merely turned to the next triangular cutting edge. After the three triangular cutting edges on one end of the tool have been used up, the tool is reversed to the other end so that, in effect, each cutting element is the equivalent of six single-point tools.



Accuracy of resetting the tools, without removal from the machine, is achieved by bringing the blades up snugly against a stop pin. Since the cutting blades are ground to close tolerances, all of the cutting elements should therefore project equidistant from the cutter head.

Among major advantages claimed is the simplicity of regrinding—e. g., worn or dull tools can be resharpened by simply squaring the ends on an off hand grinder, setting both the table and protractor at zero. T-7-21

Pneumatic Tired Fork Truck

A pneumatic-tired fork truck of 6000 lbs. capacity—the Yardlift "60"—is announced by Clark Equipment Company, 258 Champion St., Battle Creek, Mich., as a development of its Industrial Truck Division.

This unit supplements the smaller "20" and "10" Yardlifts, and features the same general construction but provides for greater load capacity and a standard lift of 112 inches. T-7-22

Supersonic Reflectoscope

A supersonic Reflectoscope, Type SR05, by Sperry Products, Inc., Hoboken, N. J., has been designed for non-destructive testing of metals and other materials for internal defects, and for testing welds. The specifications of the instrument match those of the previous model, but radical changes have been made in size, appearance and operation.

The Type SR05 is approximately 14" x 16" x 23", and is carried by means of handles on the case, eliminating the wheeled carriage which supported the older instrument. Over-all weight is approximately 85 lbs.—or about half that of the previous model. Sensitivity remains the same, but operation has been considerably simplified by reducing the number of external controls to five.

With these controls, the operator varies sensitivity, pulse width, sweep length, screen markers, and frequency. Visual indication of internal defects remains unchanged on the oscilloscope screen, but the tube is a smaller 5" high-intensity type. **T-7-23**

Fixture Type Recessing Tool

Jig and fixture type Recessing Tools, by The Maxwell Company, 386 Broadway, Bedford, Ohio, are designed for precision recessing where the tool must work through jigs or fixtures. The tools, which are available in three sizes to machine diameters ranging from ½ to 2 3/16 inches, pilot into standard bushings and operate on any manual or automatic feed spindle.

The diameter of the recess is governed by actuating stroke of the tool which is set by adjustment of the stop collar when used on manual feed spindle. Distance from the face of the work to recess is controlled by adjusting the ball-bearing stop bushing. Various types of cutters—radius, multiple-groove, form—can be used. Tool shanks also are interchangeable, shanks currently being furnished in B & S and Morse taper, adjustable adapter, Q-C and straight types, or to meet individual specifications. **T-7-24**

Bliss Welding Press

A Welding Press, by E. W. Bliss Company, 450 Amsterdam Ave., Detroit 2, is designed to permit automatic assemblies, in one step, that formerly required many separate operations. As, for example, chassis assembly, dashboards, body panels and similar fabricated assemblies.

Parts may be assembled in place on the lower die, or they may be preloaded on conveyors, after which the press cycle is completed automatically. Welding tips, in the upper die, correspond to the spots to be welded; and, as the dies close, limit switches stop the slide in correct position, the welds are made, and the slides return to loading position. T-7-25

Flexible Shaft Machine

An improved Flexible Shaft Machine, by Elliott Mfg. Co., Binghamton, N. Y., features a countershaft mounting, spaced above the motor tilt axis, to give adequate endwise yielding motion to the flexible shaft as the operator tilts the motor assembly. This reduces strain on the operator.

A lead screw principle provides a vertical adjustment operative through over 4" to give positive belt tensioning; however, an optional variable pitch pulley may be substituted for the cone pulley to provide stepless speed variation through a ratio of 2:1. T-7-26

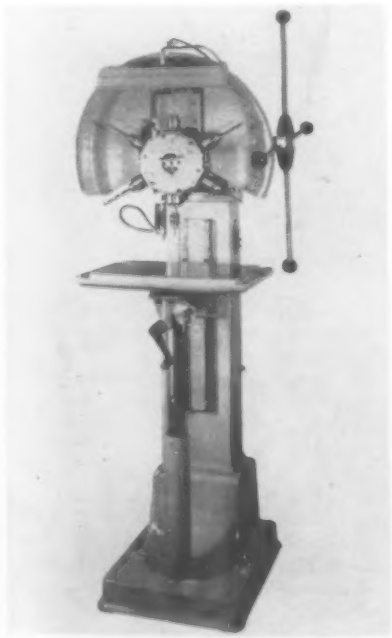
Balancer for Portable Tools

Model 7072 Balancer for portable tools weighing up to 10 lbs. is announced by the Aro Equipment Company, Bryan, Ohio. The unit, which is designed to provide in-line suspension of tools, can be quickly adjusted for correct balance and puts the tool right where the operator wants it for constant use. **T-7-27**

Indexing Drilling Machine

A six-spindle, indexing Drilling Machine—the "Burgmaster," by Burg Tool Mfg. Co., 5028 W. Jefferson Blvd., Los Angeles 16, Cal., may be set up in six different operations with the advantage that the work need not be moved from spindle to spindle as in the case of gang drills. Each spindle is brought into operating position by a short movement of the feed handle, and each spindle has its own automatic indexing depth stop.

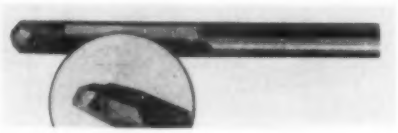
Spindle stroke is 4½", capacity, ½" drill and ⅜" tap in steel to center of 18½" circle. Pre-selective spindle speeds provide proper surface speed for each tool as it is indexed into operating position. **T-7-28**



Drill for Hardened Steel

A Carbide Drill, for drilling hardened H. S. Steel registering as high as 66 on the Rockwell "C" scale, is announced by National Tool Salvage Company, 6511 Epworth Boulevard, Detroit 10.

The drill is said to incorporate a special grind which results in faster cutting and less heat, with the result that the drill holds up longer and produces smoother holes true to size without annealing the work. T-7-29



"Ampco" for Forming Dies

Ampco Metal, Inc., Milwaukee 4, Wis., announces an aluminum bronze alloy—Ampco Metal Grade 24—which is especially suited to use for forming and drawing dies.

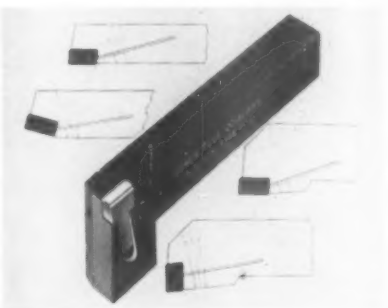
As claimed by Ampco, this intermetallic compound has been thoroughly tested and, in trials, has produced over 77,000 stainless steel drawn parts as compared to only 3000 with steel dies. Other tests indicate that dies made from this material last from 2 to 5 times longer, without redressing, than dies of previously used bronze. T-7-30

See page 62 for handy Tools of Today coupon.

Rectangular Ejector Tools

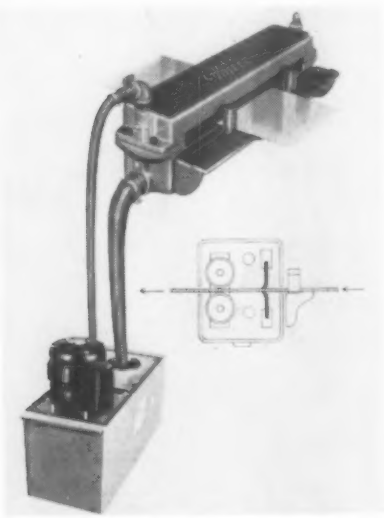
Vertical type Ejector Tools, by Super Tool Company, 21650 Hoover Road, Detroit 13, use inserts that are standard with all manufacturers of carbide, thus giving the user a wide choice of carbide grades at standard prices.

The tool shown is offered in two styles—one, a straight holder for shoulder cuts, presents the carbide insert with a 15° lead angle, or at right angle, to the work. The other is an offset holder for heavy roughing cuts; this, too, is available in 15° lead angle or right angle models. Both holders may be had for holding the rectangular inserts lengthwise or crosswise. T-7-31



Stock Oiler for Presses

An automatic pressure feed Stock Oiling Unit, for punch presses, announced by the Graymills Corp., Evanston, Ill., consists of a compact force-feed lubricator and a portable pumping unit.

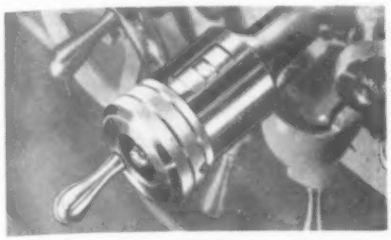


Used on roll-feed or strip-feed applications, the unit is said to offer the advantages of increased die life, cleaner stock, elimination of drip cans and hand oiling methods, and to permit the use of lubricant viscosities not practical with gravity feed oilers.

Lubricant is pumped into the oiler where it sprays both the top and bottom surfaces of the stock as it passes through. The excess oil is squeezed off and drains back into the pump reservoir, where a series of baffles in the reservoir settle out solids before the oil is recirculated. T-7-32

Cross Feed Dial

The "TriSet" Direct Reading Micrometer Cross Feed Dial, a recent development by The Springfield Machine Tool Co., Springfield, Ohio, is designed to make lathes more productive and convenient to operate. With this dial, any one of three individual direct readings may be selected for turning, boring, or depth of cut, with all three readings combined in the one conveniently located indicator.



Direct readings, in thousandths of an inch, are given through individual windows selected with a knurled ring at the front of the indicator housing. Each of the three direct readings for outside diameter, inside diameter and depth of cut is given on the one dial through its own individual window, all other graduations being completely hidden while the operator selects and sets the direct micrometer reading for the work the lathe is to perform.

T-7-33

Industrial Marking Inks

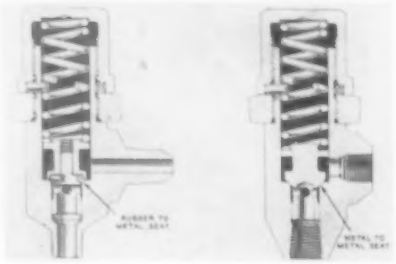
Neehi Protective Coatings, Inc., (Ink Division) Lindenhurst, N. Y., announces two complete lines of fast drying Marking Inks for machine or manual marking on any surface, asphalt or creosoted included. The one has been developed especially for automatic, semi-automatic or manual marking devices, using rubber or steel type; the other for free-hand marking, stenciling or spraying. Both are available in a wide range of colors. **T-7-34**

Adjustable Relief Valves

A series of hydraulic and pneumatic Relief Valves, by the Parker Appliance Co., Cleveland, Ohio, can be adjusted to any operating pressure in the pressure range involved by positioning a threaded cup which determines spring pressure on the shut-off piston.

In the hydraulic model, the pistons make a metal-to-metal seat with the body, while the pneumatic model is provided with a rubber-to-metal seat for positive seal where air and gases are used.

The valves are available in five pressure ranges—0-15, 10-50, 40-125, 115-250, and 235-450 psi—and these are available in each of six basic sizes from $\frac{1}{4}$" to $\frac{3}{4}$". Larger sizes, and pressure ranges up to 1000 psi, are to be had on order. **T-7-35**



Patrick Henry speaking before the Second Revolutionary Convention of Virginia in 1775.

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WALES Type "BL" Hole Punching Units punch round and shaped holes in flat sheets.

WALES Type "CD" Hole Punching Units punch over the entire area of flat sheets.

WALES Type "C" Hole Punching Units punch angles, channels, extrusions and flat sheets.

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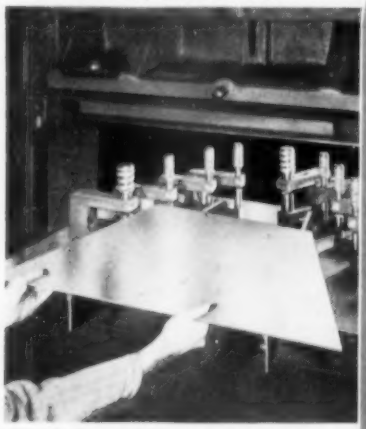
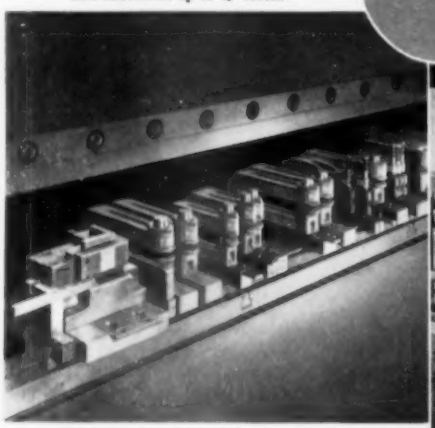
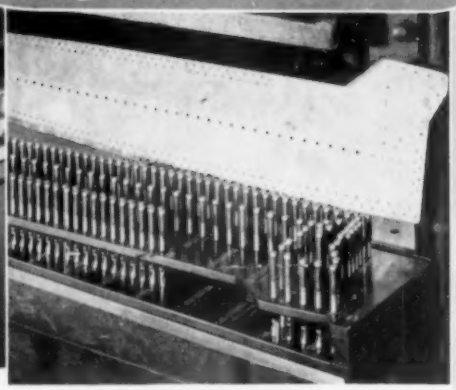


WALES Type "CJ" Hole Punching Units are heavy-duty to punch angles, channels, extrusions and flat sheets up to ½" thick.

WALES Type "H" Hole Punching Units punch holes horizontally in flanges and rims.



WALES Notching Units notch flat sheets and angles. May be used in setups with Type "BL" Units for punching and notching in same operation.



WALES Plate Set System for punching holes over the entire area of flat sheets.

WALES Strippits strip metal from conventional dies.

The above complete line of hole punching and notching equipment is one reason why so many manufacturers standardize on Wales Units for *long and short production runs.* In fact, many have adopted this standard practice rule:—Before putting holes in angles, channels or sheets by any method, call on Wales-Strippit FIRST.

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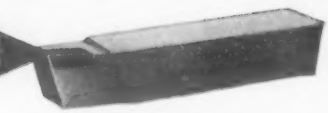

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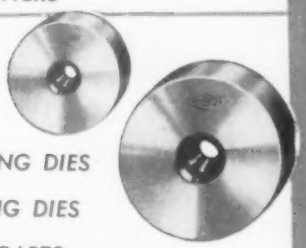

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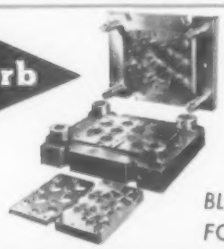
HEADING DIES
WEAR PARTS

Diecarb



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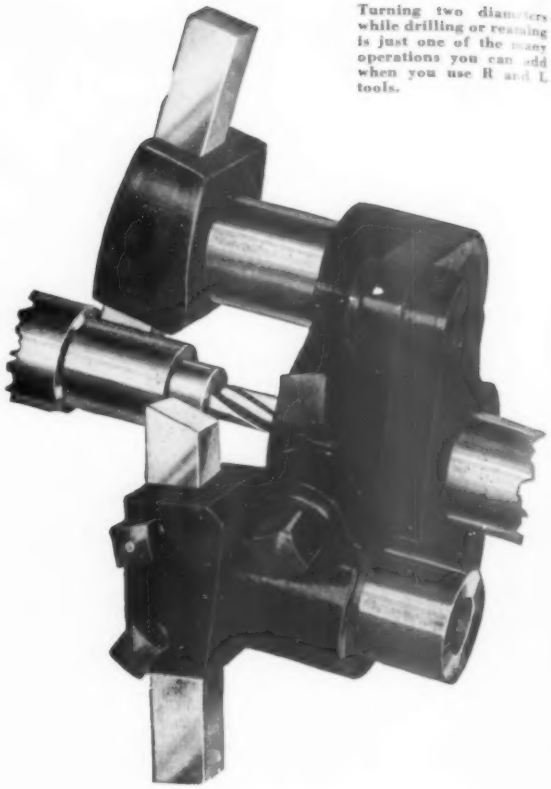

Turning two diameters while drilling or reaming is just one of the many operations you can add when you use R and L tools.

Tool Engineers who Want Extra Production Capacity Specify R and L TOOLS

Have you ever wondered why so many hundreds of R and L Tools are used daily throughout the country in every type of shop? R and L Tools employ no high-pressure salesmen. Every tool is sold strictly on its merits. They increase production capacity . . . that's one reason for their success. Another is that with R and L Tools you can actually increase the versatility of your present equipment.

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R AND L TOOLS

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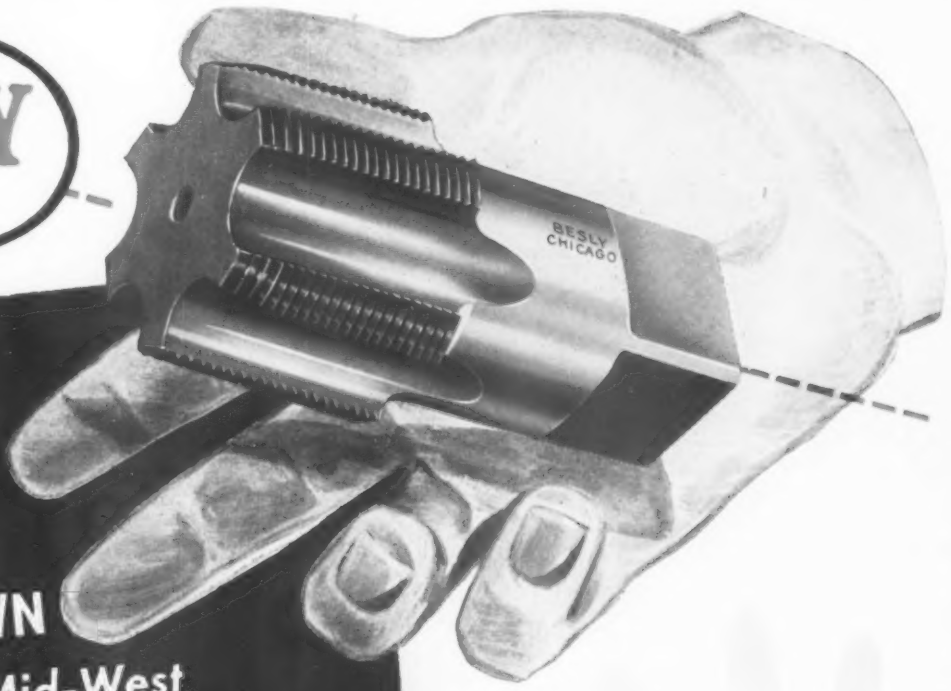
This "HELPING HAND"

BESLY TAPS



PUSHED TAPPING COSTS DOWN For This Mid-West Manufacturer

OVER 150,000 THREADED HOLES with *one* Besly Pipe Tap is the "record" achieved recently by a mid-west screw machine products manufacturer. Such performance, even for a Besly tap, is far beyond reasonable production expectations. Nevertheless, it is indicative of the kind of savings in time and money which may be made when a Besly Tap Engineer applies "the *right* tap—*made* right" to a specific tapping operation.

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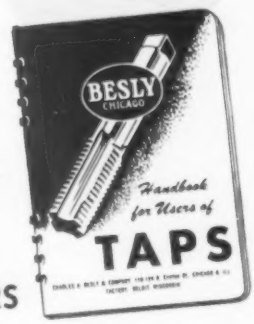

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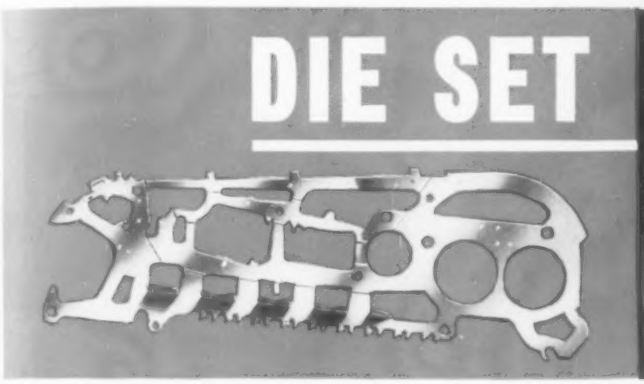
Precision stampings at Felt & Tarrant speed assembly of Comptometers

tolerances of 0.0005" held on 65 holes

. . . using DANLY PRECISION DIE SET



produces 23,000 steel stampings per grind

Here is a Danly Precision Die Set employed by Felt & Tarrant Mfg. Co. of Chicago to produce frame plates for comptometers—high-speed adding-calculating machines.

The die illustrated is mounted on a four-post Danly Standard Semi-Steel Precision Set. It trims, pierces, and notches 65 holes in .035 cold rolled strip steel. The workpiece is hand fed and positioned on dowel pins. A two-post stripper is used to prevent distortion. Production averages 23,000 pieces between grinds. Typical of other stampings produced for comptometers with Danly Die Sets, tolerance of .0005" on each hole is maintained which speeds assembly line work and permits complete interchangeability of parts.

Here again is evidence of the inherent accuracy of Danly Precision Die Sets under actual press operating conditions. Built to precision tolerances (guide posts and bushings ground to limits of .0002") they permit taking full advantage of the die maker's precision, help you hold close tolerances and get longer tool life.

Danly has a wide range of standard stock sizes available which can be quickly assembled and delivered to help you save time and money.

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- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- ● **Milwaukee 2,** 111 E. Wisconsin Ave.
- ● **Philadelphia 44,** 18 W. Chelten Ave.
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★ ASSEMBLY SERVICE

get this *free* bulletin

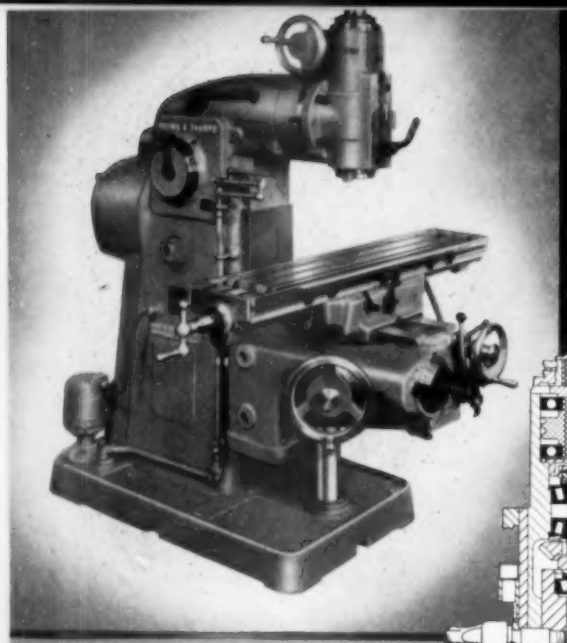
Illustrates how Danly's Special Machining and Welding Service can save you time and money for unusual die set applications.

DANLY

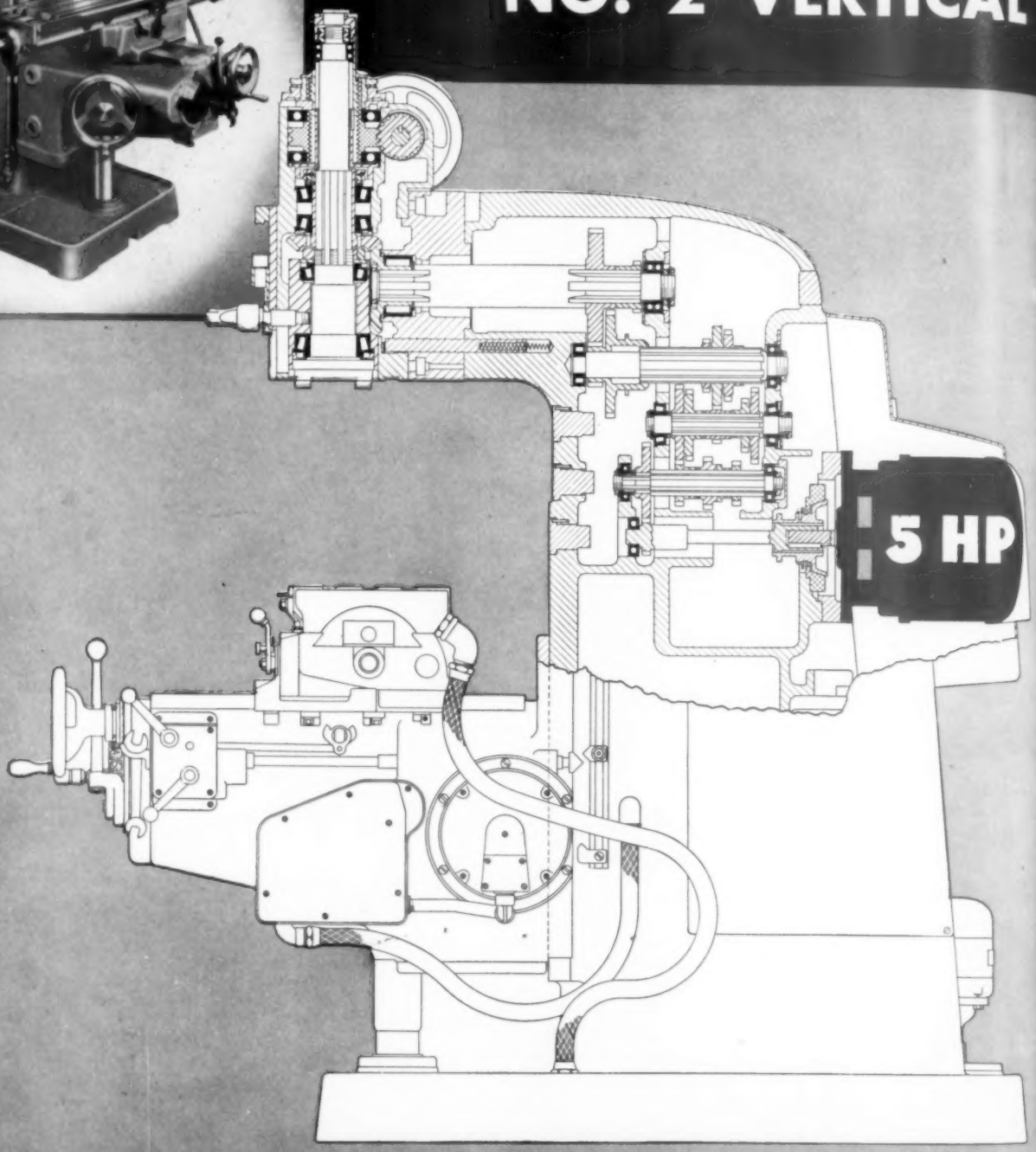
DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

PRECISION DIE SETS...STANDARD AND SPECIAL

MECHANICAL PRESSES AND PRESS EQUIPMENT



A
NO. 2 VERTICAL



CAPACITY — Longitudinal feed 28" — transverse feed, 12" — vertical feed of knee 14¾" — all power. Axial feed of spindle 3", hand. Distance, center of spindle to face of column, 14". 18 spindle speeds, 40 to 1530 r.p.m. 18 feed rates, ½" to 20¼" per minute. 75" per minute power fast travel.

BROWN &

HORSEPOWER MILLING MACHINE FOR HEAVIER CUTS

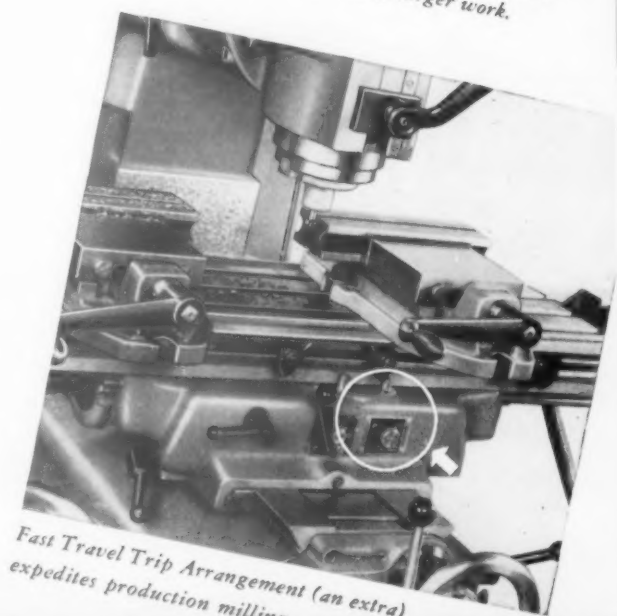
Swiveling spindle head of exclusive design offers quick angular settings.

BROAD UTILITY. This new addition to the Brown & Sharpe line embodies all the production-boosting features of the popular No. 2 Vertical Light Type Machine. In addition, it has greater throat distance, a No. 50 Milling Machine Standard taper hole in spindle, suitable spindle speeds for larger cutters and ample power plus rigidity for work requiring heavier cuts. Full 5 horsepower is available for spindle drive — with individual motors for table drive and coolant pump.

Engineered for smooth, efficient, powerful cutter driving . . . rigid column casting with integral cross bracing; short, large-diameter shafts supported directly in column; anti-friction bearings supporting all shafts in speed train; independent all-gear drives. Features like these assure highly-accurate production and long, trouble-free performance. Write for details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

Greater throat distance permits milling of larger work.

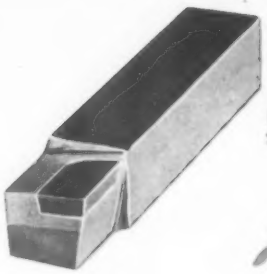
USEFUL ATTACHMENTS. As with other Brown & Sharpe Machines, additional equipment is available for the new 5 H.P. No. 2 Machine — saving time and money on many operations. This consists of Rotary Attachments — Turret Type Spindle Stop — Index Centers — Fast Travel Trip Arrangement — Micrometer Table Setting Attachment — Scales and Verniers — Short Lead and Feed Reducing Attachment.



Fast Travel Trip Arrangement (an extra) expedites production milling.

SHARPE

B·S

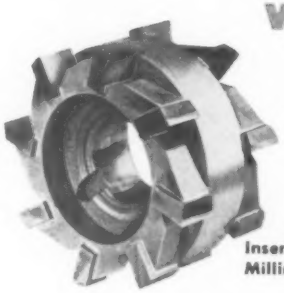


Lathe Tool with Steel Shank

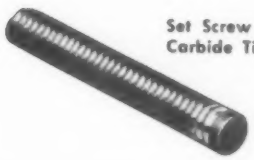
Tail Stock Center with Carbide Point

Pipe Center with Carbide Tapered End

All-CARBIDE TIPPED WITH EASY-FLO No. 3



Inserted Tooth Milling Cutter



Set Screw with Carbide Tip

Lathe Tool with Cast Iron Shank

It's the quick, low-cost way to tip one tool or thousands

Brazing with the low-temperature, free-flowing silver alloy EASY-FLO No. 3 is widely used today for mounting cemented carbide tips. It is recommended by leading tip manufacturers. The procedure is simple—the joints are as strong as the tips themselves —the cost is surprisingly low.

BULLETIN 11-A

Covers the EASY-FLO No. 3 process in detail and tells how to get fast production with torch, furnace, gas-air burners and induction heating. Write for a copy today.

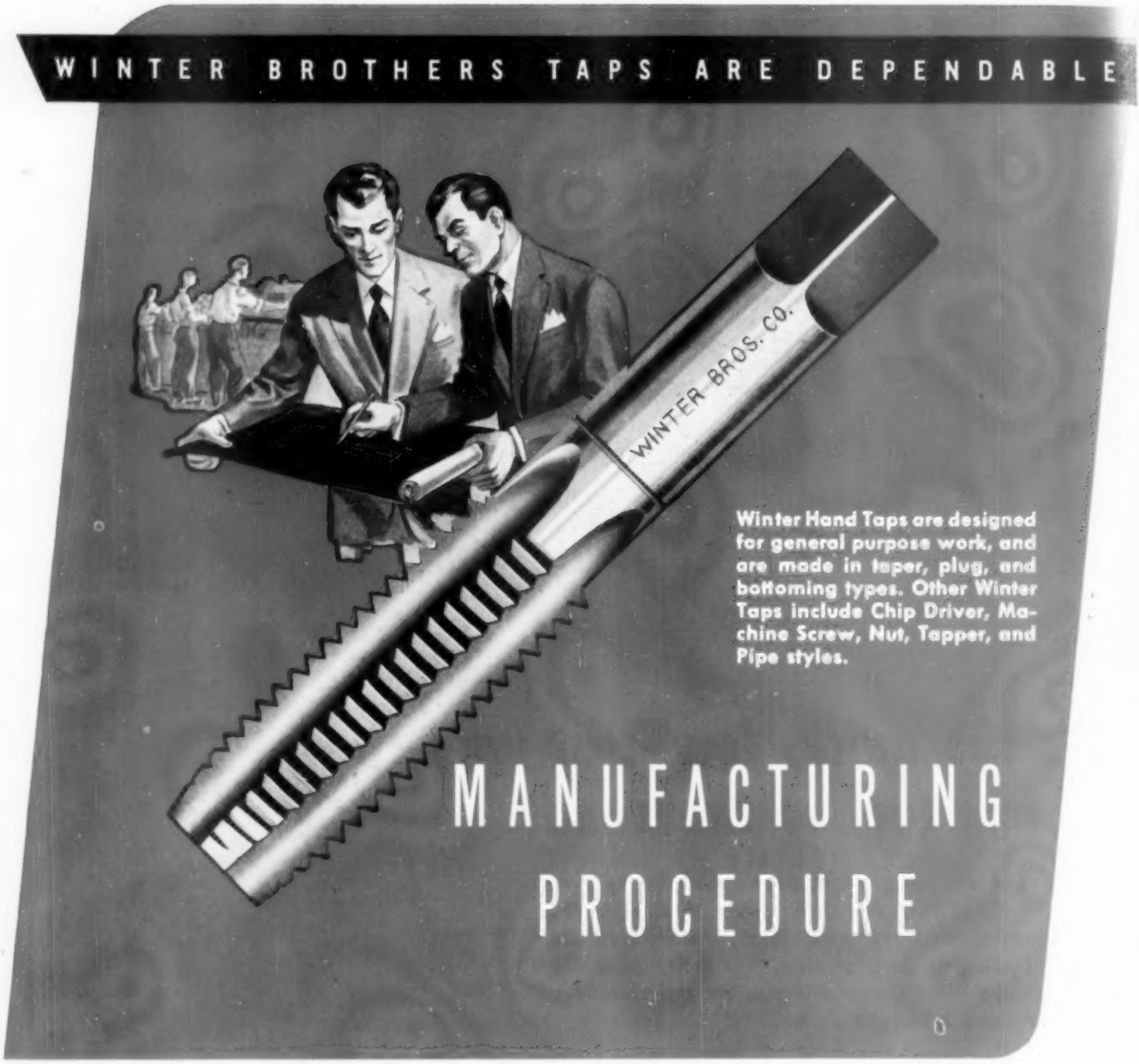
HANDY & HARMAN

82 FULTON STREET NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

WINTER BROTHERS TAPS ARE DEPENDABLE



Winter Hand Taps are designed for general purpose work, and are made in taper, plug, and bottoming types. Other Winter Taps include Chip Driver, Machine Screw, Nut, Tapper, and Pipe styles.

MANUFACTURING PROCEDURE

More than modern equipment and good materials are needed to make taps of Winter dependability. Equally critical is the ability to combine the various manufacturing steps into one efficient whole. Winter engineers have more than 47 years' experience in tool design and manufacture. This engineering knowledge, combined with the facilities of a new and modern plant, helps build dependability into Winter Taps and Dies.

Always at Your Service

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter Taps on his shelves—as close to your tapping problems as the telephone on your desk.

Winter Brothers COMPANY

ROCHESTER, MICHIGAN, U.S.A. • Distributors in Principal Cities • A Division of the National Twist Drill and Tool Company • Branch Stores: Detroit, Chicago, San Francisco

WINTER

Carbide Users:

Time...

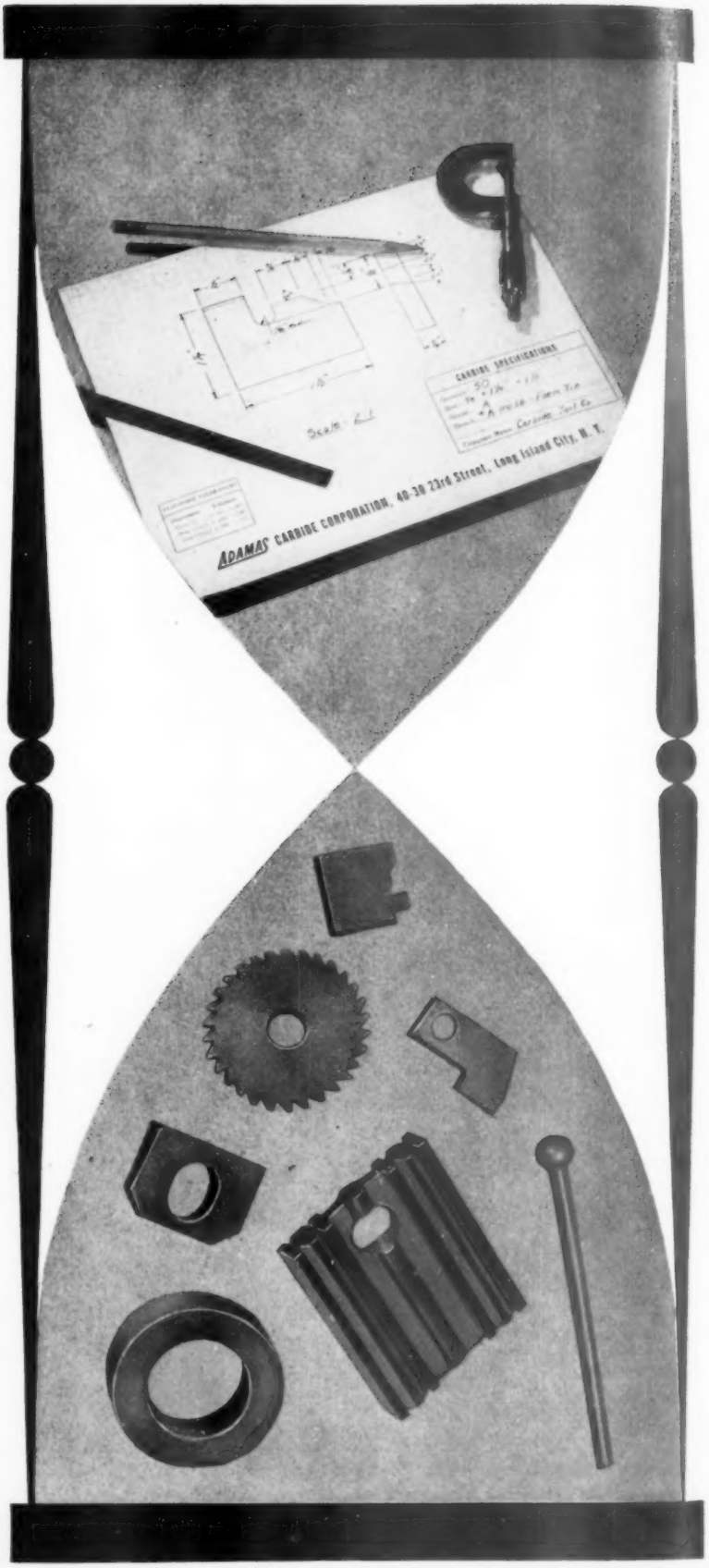
and time again...

Time is all important in maintaining your production schedule. Adamas is continually filling the everyday need of industry for immediate delivery on a top quality carbide.

Adamas standard and special blanks have a wide range of applications – from the experimental problems of jet propulsion to the high production headaches of the automotive manufacturers.

Time and time again production problems are being solved and schedules met with Adamas tungsten carbide job engineered grades.

Adamas deliveries on specials, preformed to specifications, are averaging under one week.

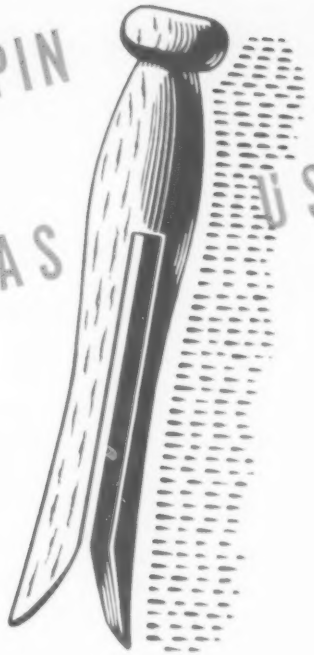


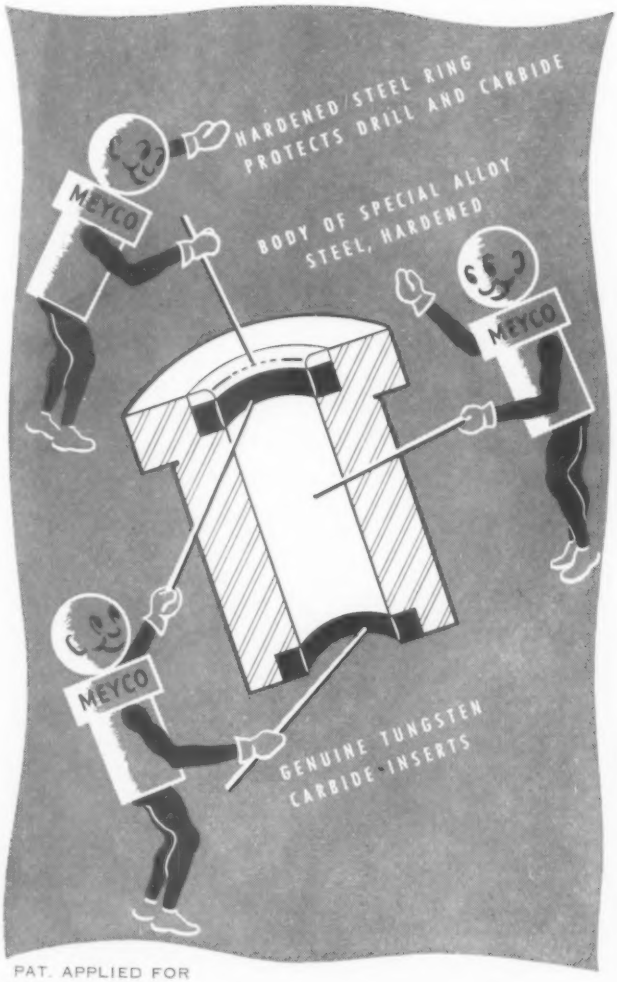
Write for the latest of the Adamas "Aids to Carbide Users", **Braze and Save,** the illustrated booklet detailing the best method of brazing carbide tool tips and wear resistant parts.

ADAMAS CARBIDE CORPORATION
40-30 23rd STREET, LONG ISLAND CITY, NEW YORK
Producers of top quality carbide for cutting tools, dies and wear resistance—both standard and special.

AS SIMPLE AS A CLOTHES PIN

AND JUST AS USEFUL!





PAT. APPLIED FOR

MEYCO Carbide-Inserted Drill Jig Bushings Cost a Little More, But Last Much L-o-o-onger!

● Will these bushings save you money? Will they cut production costs? Figure it out yourself: Actual field tests have shown that Meyco bushings with the carbide inserts outlast cast alloy, high speed steel and standard carbon steel bushings by 10 to 50 times . . . yet their cost is approximately 6 to 10 times that of ordinary bushings.

But that's not all the savings! Meyco Carbide-Inserted Drill Jig Bushings will increase the life of drill jigs and fixtures, reduce non-productive machine time and non-productive man-hours, save on spoilage, save on inspection time and increase drill and reamer life.

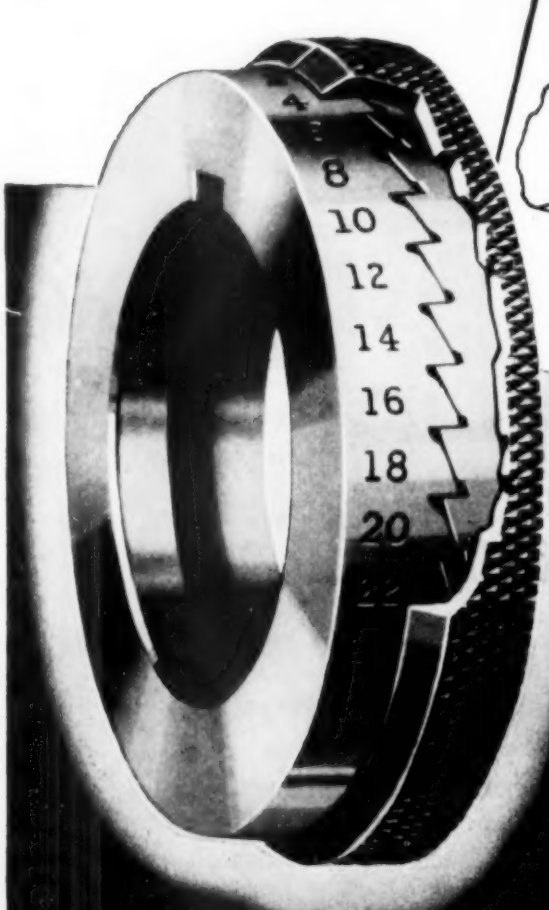
And finally, no change is necessary in drafting room or tool design. Made to ASA standards, you can start using them right away.

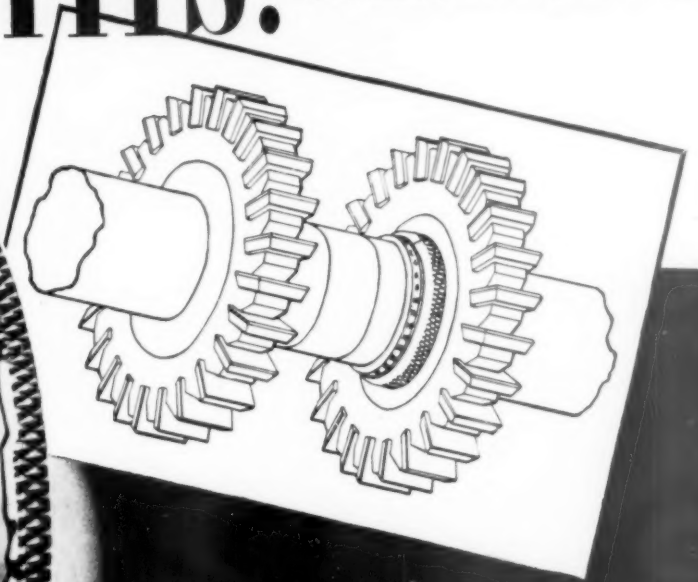
For details, further information and price schedule, write today for Meyco Bushing Catalog No.13.

W. F. MEYERS CO., INC., BEDFORD, INDIANA

GIVE 'EM FITS!

Here's how to "fit" the exact spacing requirements between cutters, in straddle or gang milling and multiple slotting setups.





S. J. Adjustable Spacing Collars

—manufactured exclusively by Scully-Jones, can be adjusted to make a perfect "fit," to the exact decimal space needed between cutters, without removing cutters from arbor to mount shims.

These adjustable collars have an expansion of .002" per step and a maximum expansion of .024". The teeth have a three-point bearing, at all times assuring uniform parallelism of the sides. They are hardened and ground and each tooth is ground on the side and face.

Count the Cost—Compare the Accuracy

—of Solid Spacing Collars made in your own shop—and you'll choose

S. J. Solid Spacing Collars

These Collars are carefully heat treated,* and widths are ground parallel to .0005 plus or minus.

Prompt delivery can be made on the standard sizes of S. J. Solid Spacing Collars.

*Except sizes of less than ⅛" thick.

See pages 128 and 129 Scully-Jones Catalog No. 500 for Adjustable and Solid Spacing Collars.

Write us for further information.

Refer to the Scully-Jones Catalog showing over 500 types and sizes of cutting tools, collet chucks, boring equipment, centers, etc.

Scully-Jones AND COMPANY

915 SOUTH ROCKWELL STREET • CHICAGO 8, U. S. A.

1918

VICKERS CUSTOM BUILT
HYDRAULIC POWER UNITS

Consolidate and Simplify your Hydraulic System into

ONE COMPLETE UNIT

These Units are individually designed for each job to include all necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc., and all needed hydraulic accessories (oil filters, air cleaners, oil level gauges, etc.) in one self-contained and compact package. Hydraulic connections to the machine are grouped in a conveniently located manifold.

Hydraulic design is simplified immeasurably. A complex circuit is delivered in a "package" ready to attach and operate. Savings in installation and maintenance costs alone make the unit well worth while. Another important advantage is the sole responsibility of Vickers Inc. for the complete hydraulic actuating circuit. Every Unit has the benefit of experienced assembly and is pretested at the factory so that it is ready for immediate operation.

Ask for Bulletin 47-45 describing the many advantages of Vickers Custom-Built Hydraulic Power Units.

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1416 OAKMAN BOULEVARD • DETROIT 32, MICHIGAN

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3320

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Blind Operator . . .

HONES 183 WRINGER GEARS PER HOUR

Case hardened gear—hole diameter .6220″ hole length ½″, maximum tolerance .001″.

THREE TIMES EVERY MINUTE each operator takes a completed wringer gear off the mandrel of a Sunnen Honing Machine. The internal diameter of this case hardened gear is honed to a smooth finish: straight, round and accurate.

At Maytag five other parts are production honed to produce smooth, accurate internal diameters; to remove heat-treat distortion; to remove burrs—and to lengthen the service life of rotating parts.

When you use Sunnen Honing, set-up time is fast, less than 5 minutes. Skilled labor is unnecessary. Operators, even girls, can be trained in an hour or less.

If your specifications call for finishing of internal diameters from .120″ to 2.625″—accuracy to .0001″, extremely smooth finish, it will pay you to investigate Sunnen Honing.

Write for booklet, or, on request, a Sunnen engineer will call at your plant.

346

SUNNEN

TRADE MARK REG. U. S. PAT. OFF. - MARCA REGISTRADA

SUNNEN PRODUCTS COMPANY

7943 MANCHESTER AVE. • ST. LOUIS 17, MO.

Canadian Factory: Chatham, Ontario

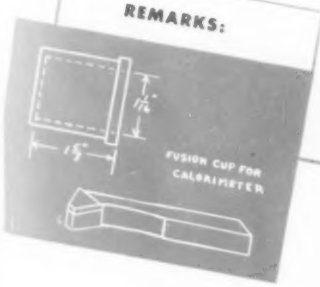
ACTUAL PERFORMANCE TEST PROVES THERE IS NO SUBSTITUTE FOR V-R CARBIDES

DETAILED REPORT:

MACHINE:	14½" South Bend Lathe.
OPERATION:	Boring Fusion Cup for Calorimeter; Bore face, bottom and outside rim.
MATERIAL:	99% Nickel.
TOOLS:	¾" Diameter by 8" Long V-R Carbide Tipped Boring Tool.

COMPARATIVE PERFORMANCE.

	V-R Carbide Grade EH	Other Carbides
S. F. M.:	225	140
F. R. REV.:	.002	.002
DEPTH OF CUT:	.020	.020
PCS. PER GRIND:	20	2 to 6
REMARKS:	V-R Carbide Tipped Tools eliminated off-tolerance rejections and produced outstanding increases in pieces per grind. Quality of finish resulted in reducing polishing time from 40 minutes to 15 minutes.	



In this and in thousands of other actual machining operations V-R Carbide tools have proven their superiority in eliminating off-tolerance rejections and producing outstanding increases in pieces per grind.

Vascoloy-Ramet carbide tools and blanks are offered in an almost unlimited choice of styles, grades and dimensions to meet any industrial requirement.

CALL your nearest V-R Branch Office today for an effective and economical solution to your production problems.

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VASCOLOY-RAMET CORPORATION WAUKEGAN ILLINOIS
District Sales and Service in Principal Cities
An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

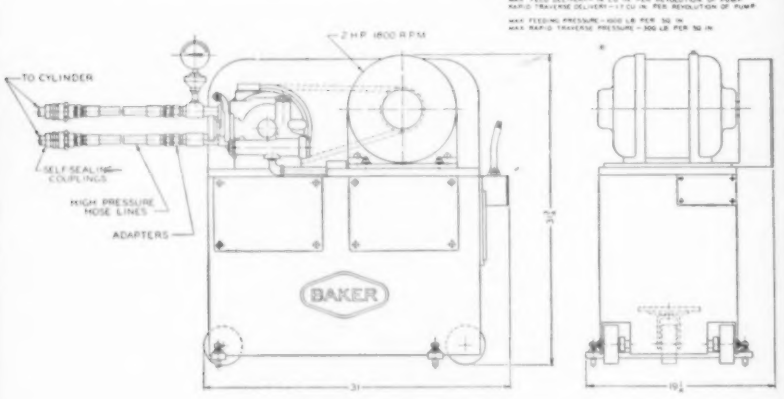
BAKER

NEW HYDRAULIC DRILL

Assures maximum productivity!

Baker's New Model 17HO vertical hydraulic feed drill, introduced at the Chicago show, is designed to afford a variety of spindle speeds and for rapid exchangeability of hydraulic feed power units. 19 speeds are available in each of the 8 speed ranges through exchanges of pick-off gears that provide spindle speeds from 40 to 1575 RPM. A completely separate mobile hydraulic pump-sump unit achieves maximum productivity by allowing a rapid and easy exchange of hydraulic feed power whenever desirable.

Baker 17HO is equipped with an adjustable table for varying work heights and is adaptable to either single or multiple spindle operations. Other features include: ample sump in base for coolant ... 2" high speed twist drill capacity ... saddle feed through 3¼" diameter cylinder ... head mounted on hardened steel ways ... 13" width of way, 16" travel. This model may also be supplied with stationary or vertically adjustable hand index table, or automatic power index table. For more information write for circular No. 69216.



HYDRAULIC PUMP AND TANK UNIT

FOR VERSATILITY
BAKER
MOBILE POWER UNIT

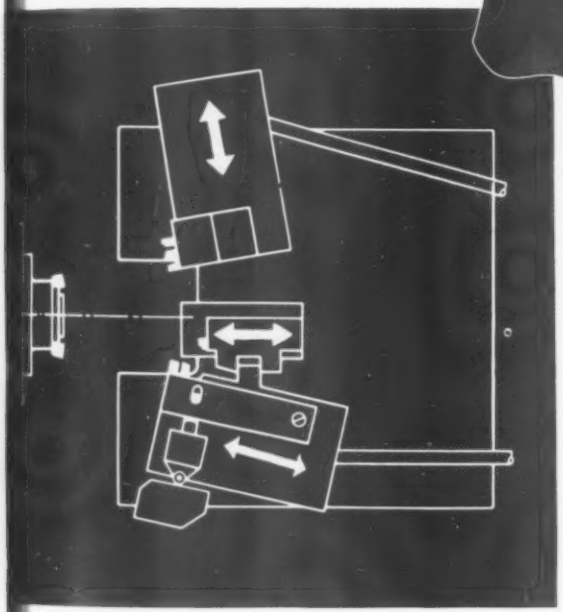
Separate variable delivery mobile pump sump unit (shown at left and at rear of Baker 17HO) provides hydraulic feed power for the 17HO and other new Baker models. The unit is mounted on casters and is connected to the operating cylinder of the machine by only two self sealing couplings designed to permit a fast exchange of hydraulic power units without influx of air into the hydraulic system. Units may be switched with negligible loss of production time.

BAKER BROTHERS, Inc., Toledo, Ohio

DRILLING...TAPPING...KEYSEATING...CONTOUR GRINDING MACHINES

the GISHOLT SIMPLIMATIC

Works All the Angles...



THE SIMPLIMATIC's large platen table provides a platform upon which tool slides may be mounted in any position. Above is a typical tool layout—designed for machining bevel gear blanks. Angular feeds are no problem. Compound slides are seldom needed. Write for literature.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round or partly round parts. Your problems are welcomed here.

COMPLETE FREEDOM IN PLACING TOOL SLIDES

... enables you to meet your own specific needs for high-speed automatic machining ... and do it with a standard machine.

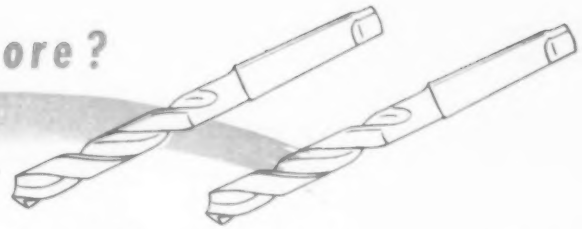
GISHOLT MACHINE COMPANY

Madison 10, Wis.

TURRET LATHES · AUTOMATIC LATHES
SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

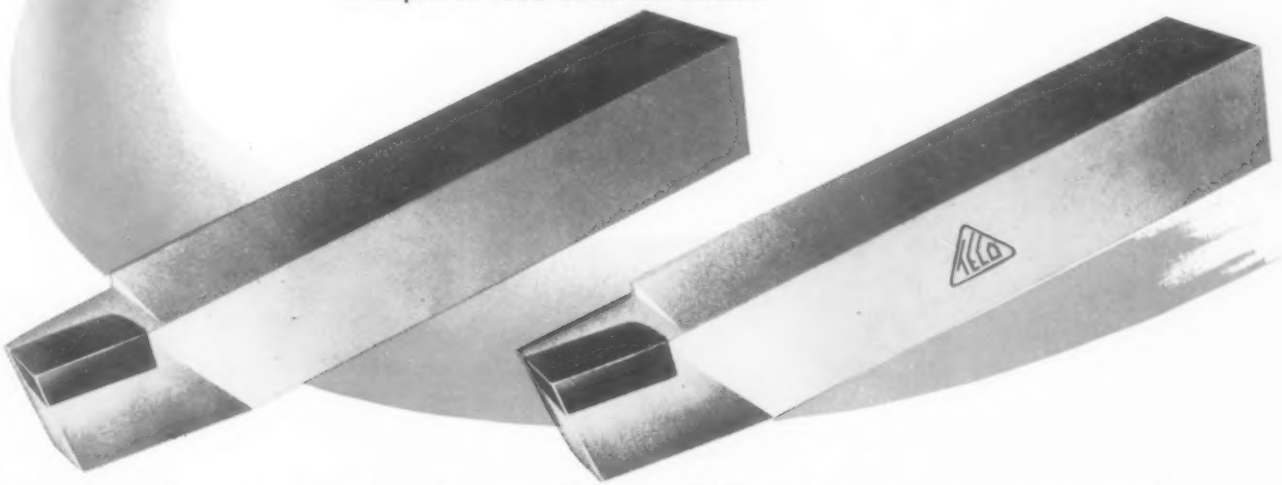
Which Drill will produce more?

You can't judge a drill by its looks—they're all shaped alike. Only by actual use can you determine the big differences in productivity.



Which CARBIDE will produce more?

All standard carbide blanks and tools look alike. Only by running on your own machines can you discover the greater productive capacity of Improved TECO Cemented Carbide.



Production reports show 3 to 10 times more pieces with Improved TECO Cemented Carbide

OPPORTUNITY FOR TOOL MANUFACTURERS to cash in on fast-growing demand for TECO Cemented Carbide. Write us for full details.

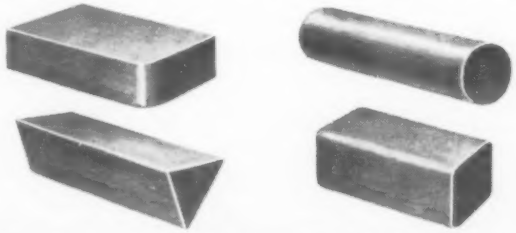
●

MILL SUPPLY HOUSES — Territories open for line of standard TECO Cemented Carbide Tools. Write us.

Tool up any carbide job with Improved TECO in place of your present carbide. Prove to yourself that it stays on the job much longer—removes more metal—produces more pieces—operates at higher speeds and feeds—gives a better finish.

Your experience should duplicate that of many other leading plants who are getting from 3 to 10 times more pieces with Improved TECO Cemented Carbide. Why not make the test? When ordering blanks or tools, send details of set-up for proper recommendation. Ask for latest catalog and price list.

TUNGSTEN ELECTRIC CORP. 570 39th Street, Union City, N. J. — Representatives: Indianapolis • Cleveland • Detroit



IMPROVED TECO CEMENTED CARBIDE

Manufacturers of Tungsten Carbide — from ore to finished material — for over a quarter century

These labels tell you...

Hanna Air Cylinders are designed for operation up to 110 p.s.i., and to 250 p.s.i. with minor modifications . . . in sizes from 1½" to 20" diameters.

For more than 40 years the Hanna name plate has been a familiar trademark-of-quality throughout industry. Those who demand the best in cylinder performance, reliability and long life specify Hanna Air and Hydraulic Cylinders for 1001 uses . . . to push, pull, lift, press, clamp or control . . . for the products they build for sale . . . to save manual labor and increase production in their own plants. There are standard Hanna Cylinders to meet most mounting requirements . . . to solve many of *your* problems.

Hanna Hydraulic Cylinders may be operated at working pressures up to 1500 p.s.i. . . . available in a variety of types and capacities.

Send for Hanna Air and Hydraulic Cylinder Catalogs

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

1765 Elston Avenue, Chicago 22, Illinois

2 Minute Success Story

Simplex center hole jack is slipped over a rod tack welded or similarly attached to the part to be pulled. Nut screwed on this projecting rod provides bearing surface for cylindrical ram to push against. This exerts a direct pull on object to be lifted.

This man is pulling valve seats from an oil well slush pump.

ACTUAL PULLING TIME: 2 MINUTES . . . with this center hole Simplex hydraulic "Jenny" built by Templeton, Kenly & Company.

When a Nickel alloyed steel unit of this kind takes hold, something has to move.

Terrific tensile and torsional stresses imparted by its pull frequently render or shear carbon steel rods attached as described in the caption. In contrast, rods of SAE 3145 or 3250 Nickel-chromium steel resist these high stresses.

A Nickel-chromium steel casting approximately equivalent to SAE 3145 in composition forms the housing for this unit, because such an alloyed casting alone provides adequate strength for the work.

In shipyards, mines, oil fields, railroad shops, construction and general industry, these jacks pull cylinder liners, form ship and boiler plates, remove gears and pulleys, pull off propellers and do many other jobs. A 100-ton capacity model, especially designed for pulling in stern tubes on ships, has a 3½-inch center hole. Smaller models of 30, 60, and 80-ton capacities are also available.

The Simplex jenny proves that it pays to use a Nickel alloy for tough jobs.

EMBLEM OF INCO SERVICE

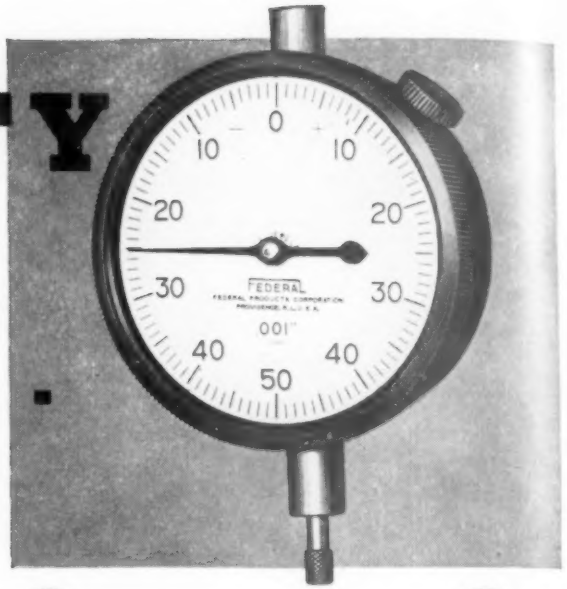
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the selection, fabrication, treatment and performance of engineering alloy steels, stainless steels, cast irons, copper-base and other alloys containing Nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

VISIBILITY

wears a face like this . . . .



In telling time in measuring speed in calculating temperature in measuring pressure the dial face has proved the most satisfactory, the modern way of providing instantly-readable measurements. And when it comes to dimensional gaging, many cost-conscious plant managers now know that Dial Indicator Gages cut down seconds and rejects save time and eliminate re-inspections.

Here is the modern inspection method that enables workers to see dimensions instead of *feeling* for them. They know not only whether the work is off, but the exact amount that it is off. And Dial Indicators have now been built into so diverse a range of gages, that there is a type for virtually every production problem involving dimensional control. Your control limits may be fine or coarse; Dial Indicator Gages give you *accuracy* and *speed*.

More important, you can use Dial Indicator Gaging for inspection *while the parts are still in production*. Your control limits are set up on a Dial Indicator; samples are inspected on a predetermined schedule; the machine's tendency to exceed these limits is quickly spotted. At all times the operator knows where he is; he adjusts the machine *before the scrap is produced*.

Two types of Dial Indicator Gages are briefly described on the opposite page. Many other types are available. We make Dial Indicators and Dial Indicator Gages — both regular and custom-built — to meet the needs of users in hundreds of industries. For highly specialized needs, we also make Air Gages and Automatic Electronic Sorting Gages. Our collective experience is available to you — through the Federal Field Representative in your territory or direct from our design department and factory. You may save both time and money by calling upon this experience.

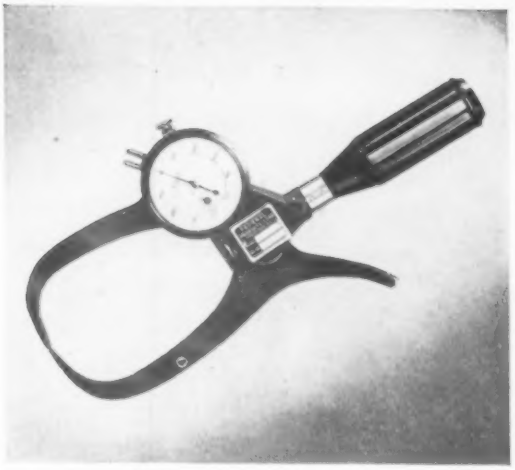
FEDERAL
FEDERAL PRODUCTS CORPORATION

YOUR PROFIT DECISION IS *Visible** PRECISION

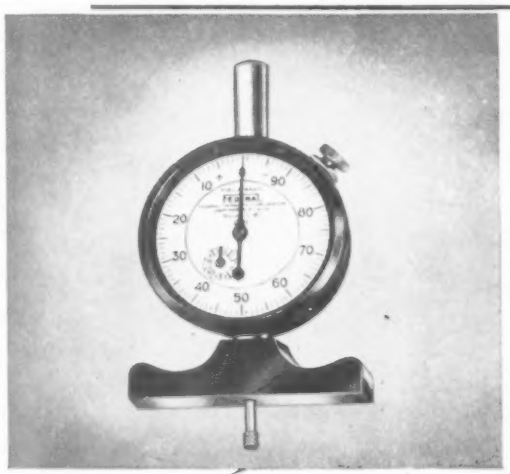
*The use of Dial Indicator Gages — visible precision — lowers inspection costs, raises production. Federal Products Corporation is America's largest maker of both regular and custom-built gages — mechanical, air, electronic — for the measurement of single and multiple dimensions

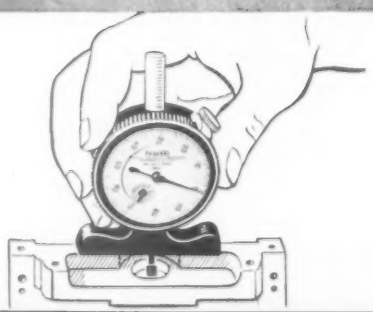
HERE — for example

THE DIAL INDICATOR
is used to check outside dimensions



This Caliper Type Indicating Gage checks outside dimensions faster and much more conveniently than old-style caliper gages. (Other models are made for inside dimensions.) Arm can be designed to your specific requirements, they permit measurement over, under or around all types of obstructions. You read the Dial Indicator and know at once if the dimension is right — or how far it varies from the specifications.





Another Application

THE DIAL INDICATOR
creates Depth Gages of greater accuracy

These Depth Gages provide a more positive, accurate and fast method of inspecting depths of holes, slots and other recesses. With old-style, conventional flush-pin gages you rely entirely on the sense of feel. Dial Indicator Depth Gages give you the exact measurement at a glance, show you whether the work is satisfactory or off-size — and exactly how much off-size. Special bases and points can be supplied to meet your particular requirements.

Write for illustrated Bulletin #39 to receive detailed descriptions of the above gages. Let us help you with any problem of gaging and inspection. If you will send us blueprints of work to be measured, we will gladly recommend the proper gage. No obligation is involved.

FEDERAL PRODUCTS CORPORATION 1144 Eddy St., Providence 1, R. I.

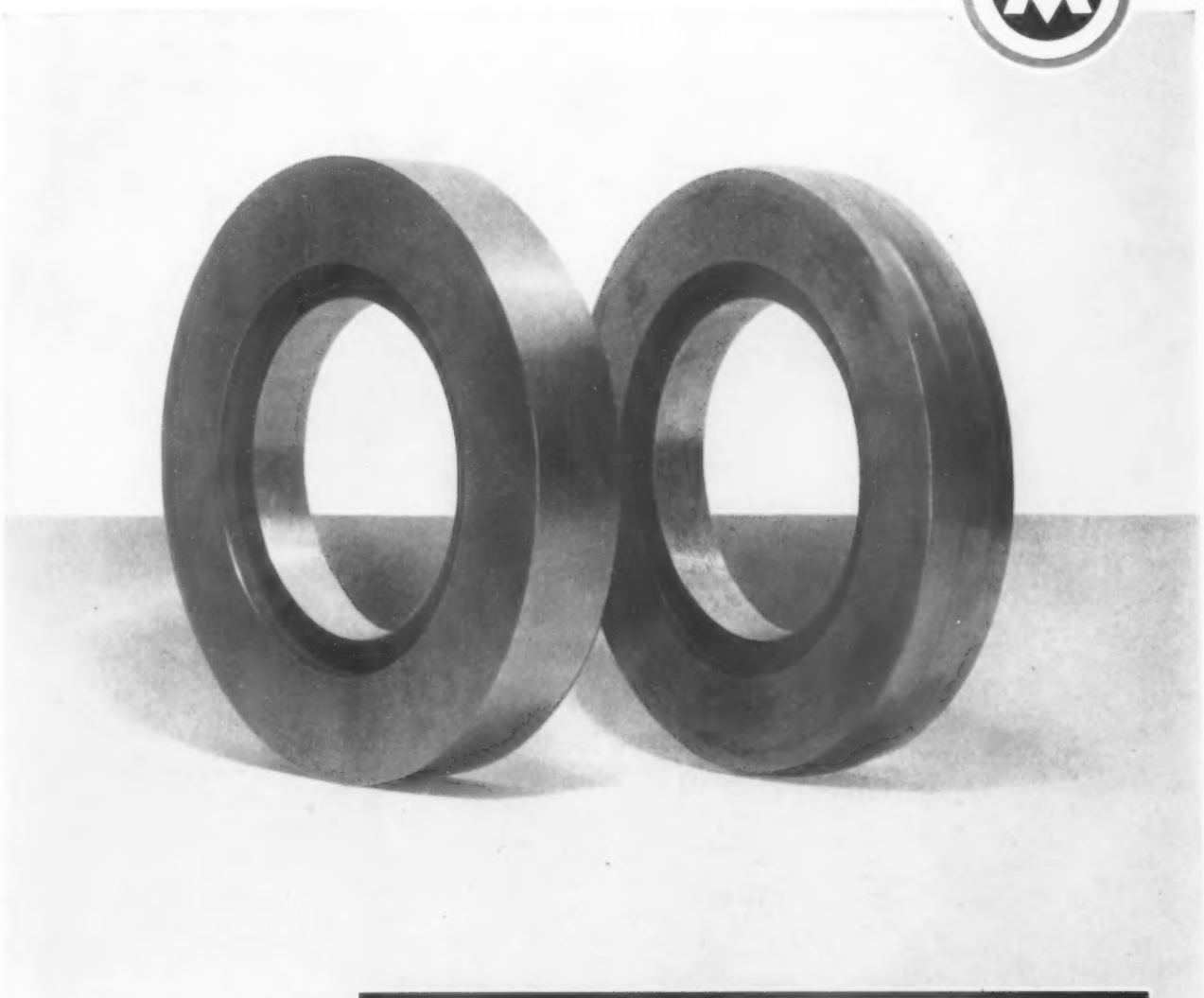
Represented in Canada by RUDEL MACHINERY COMPANY, LTD.

TWIN TOOL STEELS

Midvale Diamond Brand and Diamond-A high carbon, high chrome tool steels meet customers' requirements for tools with high hardness, resistance to abrasion and minimum deformation. They differ in this respect: air hardening Diamond-A is somewhat more machineable and slightly less resistant to abrasion than oil hardening Diamond Brand. Both can be forged, as well as machined. They have a wide variety of application, including dies, rolls, punches, gauges, saws, paper mill knives, hobs, etc. Either can be depended upon to the limit.

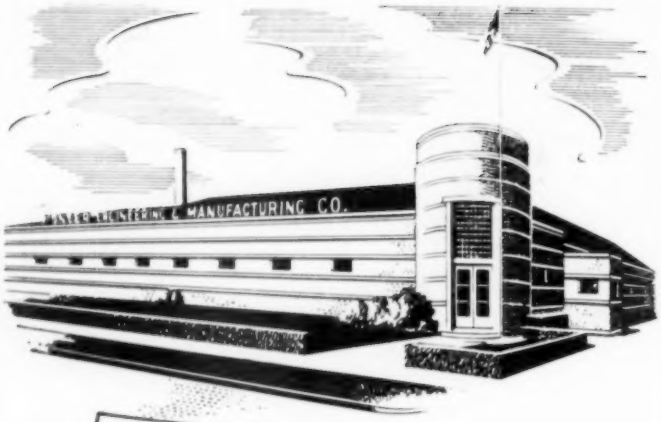
THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

OFFICES: NEW YORK • CHICAGO • PITTSBURGH
WASHINGTON • CLEVELAND • SAN FRANCISCO

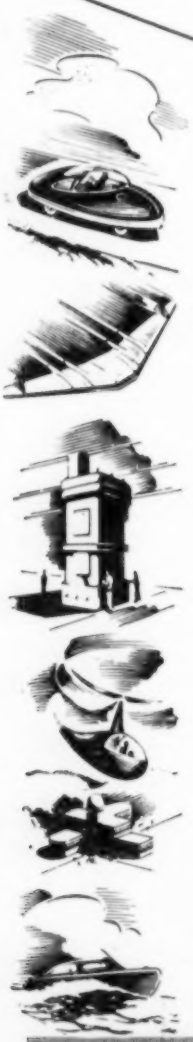


STAINLESS AND TOOL STEEL BARS
•
CORROSION AND HEAT RESISTING CASTINGS
•
FORGINGS AND RINGS

MIDVALE
Custom Steel Makers to Industry



FACILITIES *Plus*



. . . AT YOUR COMMAND

Engineers, designers, tool and die experts, production specialists — the entire Pioneer staff is at your command. They will work for you in solving a simple problem such as the design of a tool, die or fixture; or they will work equally well in solving your bigger problems.

Their accumulated experience and skill on many different products frequently points up your answer in shorter time. And with costs mounting at every turn, it is doubly important to investigate every avenue by which these costs can be lowered. Let us take some of the burden off your shoulders.

GET THE COMPLETE STORY...

Ask for a copy of "The Answers To Industry's Problems". This brochure explains in detail the many services available from Pioneer.

Pioneer Engineering and Manufacturing Company

19645 JOHN R STREET
DETROIT 3, MICHIGAN
PIONEERing Better Production Methods and Tools

Still the Best Performer

3P HEAD TYPE PUNCHES

IMMEDIATE DELIVERY on all STANDARDS

★ SPECIALS TO ORDER ★

SEND FOR CATALOG

3P Punches Consistently Give An Outstanding Performance In The Stamping Industry. For A Durable, Cost-Saving, Dependable Punch, 3P Has No Equal.

Manufactured By

PORTER PRECISION PRODUCTS
Cincinnati 12, Ohio

Distributed By

DIEMAKER SUPPLIES, INC.
2779 E. Grand Blvd. • Detroit 11, Mich.

SMITITE DIAMOND

Tool life, speed of cut, increased production depend upon the diamond tool. Smitite Dressers contain a number of small, whole diamonds, which may be completely consumed without resetting. They are evenly distributed throughout the sintered matrix, permitting several stones to contact the wheel. There are many types for rough- or finish-grinding, on wheels of any size and hardness.

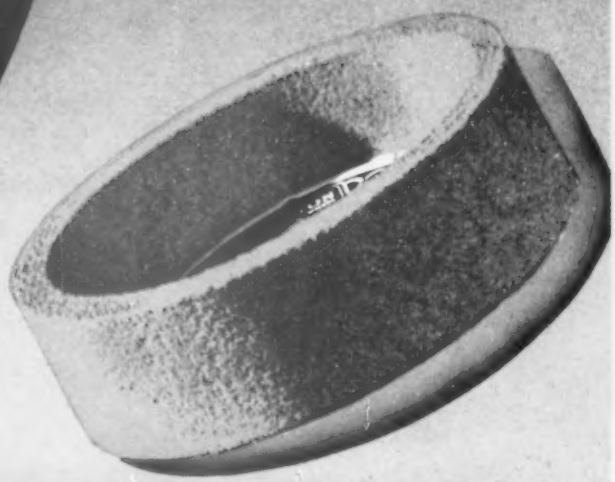
Catalog on request

J. K. SMIT & SONS, INC.
157 Chambers St., New York 7, N. Y.
6400 Tireman Ave., Detroit 4, Mich.
129 Adelaide St. West, Toronto, Ont.

Grind Faster... Grind Cooler
Grind Longer... Grind for Less
with
32 ALUNDUM® GRINDING WHEELS

Yes — you really can grind for less with 32 ALUNDUM wheels.

Why? — Because 32 ALUNDUM abrasive is *entirely different from any other abrasive* — made differently by a unique Norton process which you'll find described on the other side of this page.



NORTON ABRASIVES

Here's why you can grind for less

with the Sensational 32 ALUNDUM Grinding Wheels

BY an ingenious Norton-developed and patented process the grains of 32 ALUNDUM abrasive form in the electric furnace in a fluid matrix. This allows each grain to grow into a single, complete crystal—strong in shape and *with many sharp points on all sides.* Result: a faster and cooler cutting action.

And the matrix serves a dual purpose for it also absorbs the impurities present in the melt. Thus 32 ALUNDUM abrasive is over 99% pure fused alumina—*more actual cutting material than in any other abrasive.* Result: less dressing, longer wheel life.

By a complicated chemical process the matrix is dissolved away and the released grains are then washed and screened to size. *No crushing is necessary.*

That this sharper, purer abrasive really cuts grinding costs is being demonstrated every day in thousands of plants.

Are you taking advantage of 32 ALUNDUM grinding wheels?

A Demonstration

Here you see 32 ALUNDUM abrasive as it comes from the electric furnace—the individual crystals imbedded in the matrix in which they "grow." As this matrix is dissolved the grains are released—ready for screening to size.

See It Yourself

You'll find this demonstration and many more in the new Norton motion picture on 32 ALUNDUM abrasive. Arrange for a showing of this 16mm. Kodachrome sound film in your plant—no obligation.

Use "32" for

TOOL GRINDING

SURFACE GRINDING

INTERNAL GRINDING

CYLINDRICAL GRINDING

CENTERLESS GRINDING

NORTON ABRASIVES

NORTON COMPANY, WORCESTER 6, MASS.

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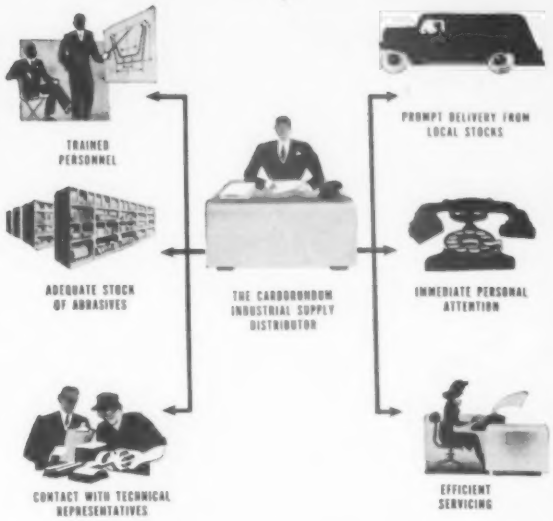
A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
Where is there a convenient Source of Supply?



ANSWER BY

CARBORUNDUM
TRADE MARK

As an efficient and dependable source of supply, the services and facilities of your CARBORUNDUM distributor offer time and money saving advantages.

From large and varied stocks of abrasives located conveniently nearby, the products you need are available without delay. Plant inventories can be safely and economically reduced.

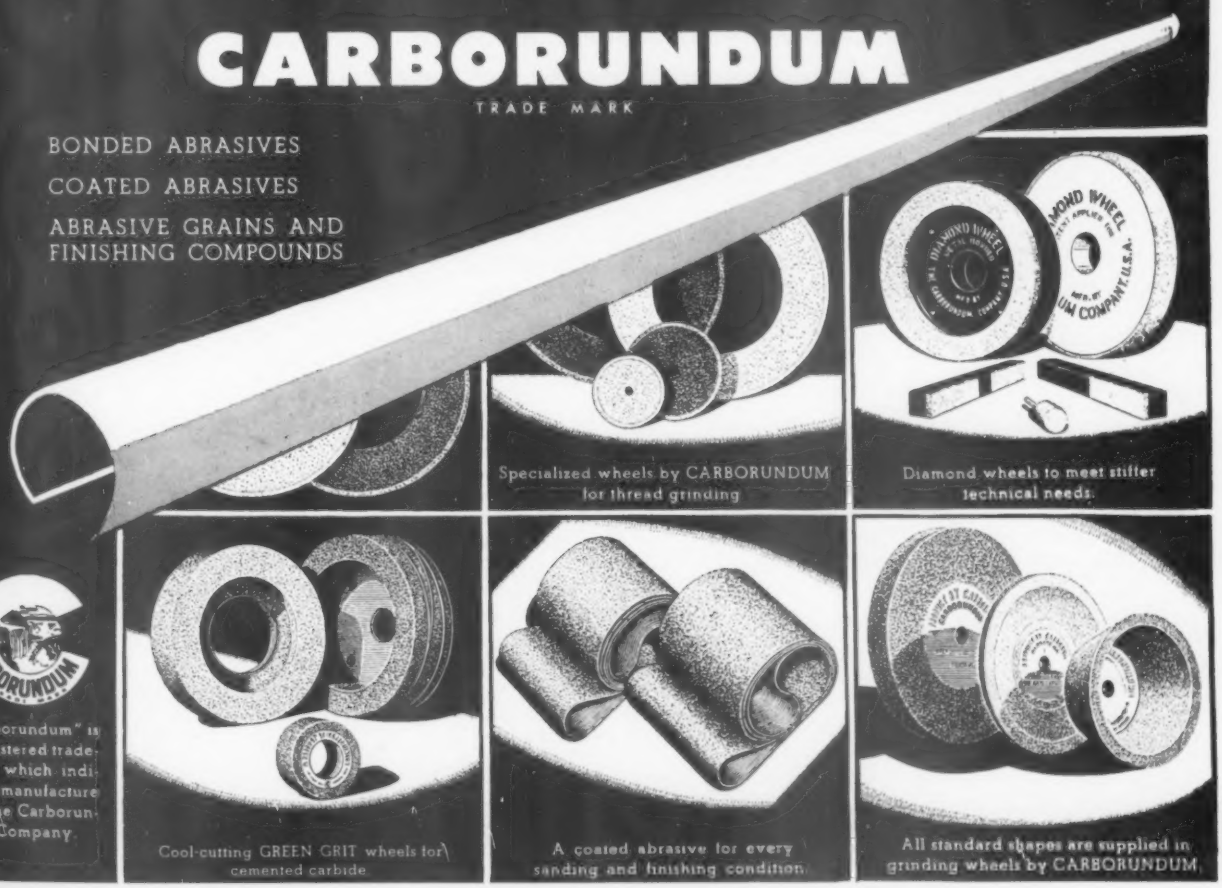
Frequent personal service by a trained and experienced local staff provides reliable facts and figures on abrasive applications and operations.

On difficult or unusual jobs, direct assistance from CARBORUNDUM representatives is available.

Simplified buying and other important savings realized from intelligent and efficient handling are creating an increasing preference for abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
TRADE MARK

BONDED ABRASIVES
COATED ABRASIVES
ABRASIVE GRAINS AND FINISHING COMPOUNDS



Specialized wheels by CARBORUNDUM for thread grinding

Diamond wheels to meet stiffer technical needs.

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company.

Cool-cutting GREEN GRIT wheels for cemented carbide

A coated abrasive for every sanding and finishing condition

All standard shapes are supplied in grinding wheels by CARBORUNDUM

CARBON TOOL STEEL

The Toolmakers' First Choice

Some shop men have the impression that an expensive, high-alloy tool steel is the best choice for a new tool or die job. Not so! An experienced toolmaker automatically thinks first of carbon (or carbon-vanadium) tool steel. He may quickly reject this selection, but he does recognize that carbon tool steel is the logical place to start.

CARBON TOOL STEEL—THE GENERAL-PURPOSE GRADE

There are good reasons why water-hardening, carbon tool steels are selected for a wide range of tool and die jobs:

1. They are the easiest to machine of all tool steels.
2. They are easy to heat-treat.
3. They are not subject to excessive decarburization.
4. They develop keen cutting edges.
5. They provide high surface-hardness, with a tough core.

APPLICATIONS AND BETHLEHEM GRADES

Bethlehem X Carbon, with carbon content from 0.75 to 0.85 pct, is generally used for hand chisels and shock tools. Bethlehem XCL, XX, and XXX grades have several ranges of carbon content: 0.90 to 1.00 carbon for cold-heading die steels, 1.00 to 1.10 carbon for general-purpose tools and dies, and 1.15 to 1.25 carbon where keen cutting edges and more wear-resistance are needed for stone-dressing tools, drawing dies, paper knives, etc.

Bethlehem Carbon-Vanadium tool steel grades for similar applications are known as Best and Superior.

THE IMPORTANCE OF CONTROLLED HARDENABILITY

Bethlehem carbon grades have a hard outer case, reinforced by a tough, shock-resisting core—due to close control of hardenability in the steelmaking process. The controlled hardenability and spheroidized structure assure uniform results in heat-treatment. The easy machining structure of Bethlehem carbon tool steels is achieved by careful spheroidize-annealing in our modern furnaces. Our extensive metallurgical research has established the ideal degree of hardenability for a wide range of applications.

PROMPT DELIVERIES

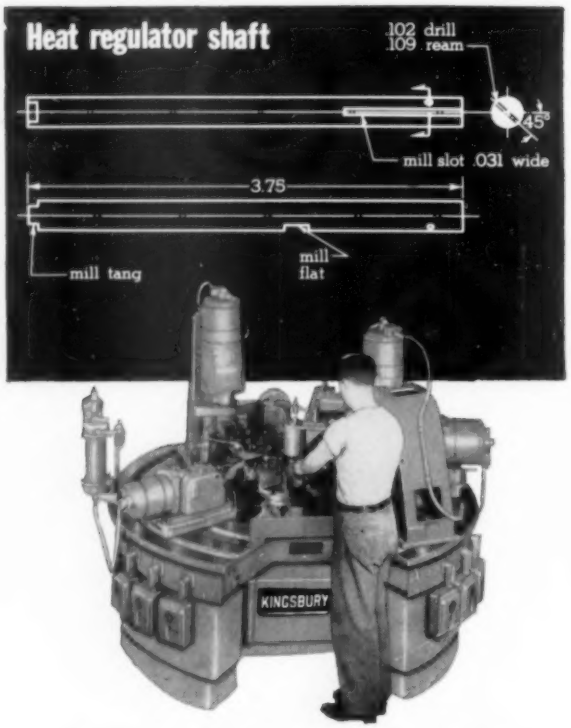
Bethlehem grades . . . carbon and a complete range of alloy tool steels . . . are delivered promptly, either from our mill depot or from your nearest Bethlehem tool steel distributor. Our technical staff is ready to work with you at any time.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor:
Bethlehem Steel Export Corporation

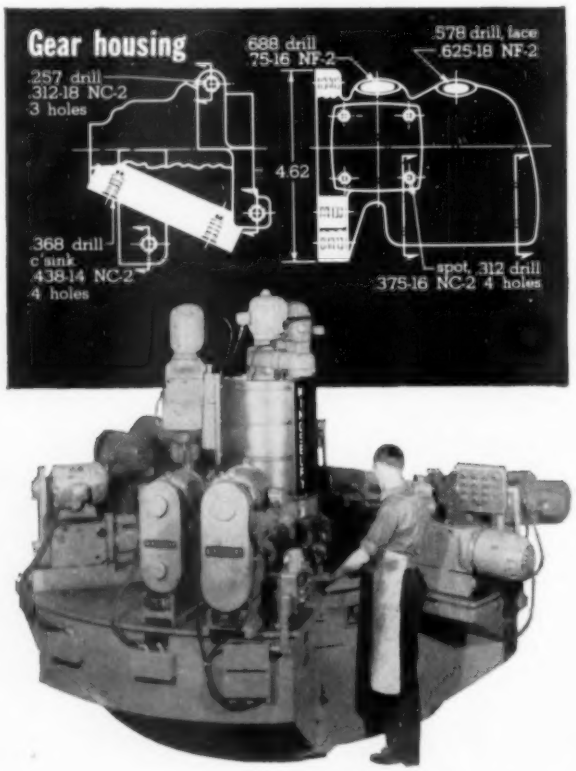
BETHLEHEM STEEL

CARBON . . . one of Bethlehem's Fine Tool Steels

. . . . . 6 Ways



A HORIZONTAL INDEXING MACHINE drills, reams and mills 370 shafts an hour gross. Each part is chucked in 1 of 6 identical fixtures and indexed to each automatic unit in turn.



AN INDEXING MACHINE WITH CENTRAL COLUMN operates 35 spindles on 4 faces of part in 1 chucking. When the table indexes, 12 chucks each rotate 90° Rate is 340 parts an hour.

Operators' pay and initial cost of these 6 machines together average 1/7 cent per operation

If every machine shown here were used only 3 years and the operators received good wages, the average cost for man and machine together would be $0.0014 per operation. (One tool in one hole counts as one operation.) We divided the total investment over 6000 hours, assumed 80% efficiency and omitted power and overhead costs.

Additional Savings

Less handling, extra space. One Kingsbury replaces several general purpose machines.

Uniform product. Automatic cycles never vary. Fixtures that index are identical duplicates.

Accurate location of operations. Bushings guide drills and reamers. All operations are finished without disturbing the work in its fixture.

Smooth finish, efficient operation. Spindles for different operations are independent and run at the exact speed and exact feed required.

Accurate, Rugged Construction

Most Kingsburys must pay for themselves in months, but they will do accurate work for years at intense production. We normalize castings before machining, and induction-harden and shave gears. Spindles run in preloaded precision bearings. Eleven accurate jig borers bore index tables, fixtures and bushing plates. We never release any machine until it produces sample parts that meet the customer's specifications.

Efficient Use of Standard Equipment

In the Kingsbury line are 12 standard automatic drilling and tapping units (max. 5 hp) with a total of 82 standard attachments, 8 standard indexing units and 18 standard bases. There are 6 basic types of machines as these photos show. Our top men study and discuss ways to combine operations using this equipment until they agree on the most economical solution. We have designed, built and tooled over 3400 automatic drilling and tapping machines. It is our exclusive business.

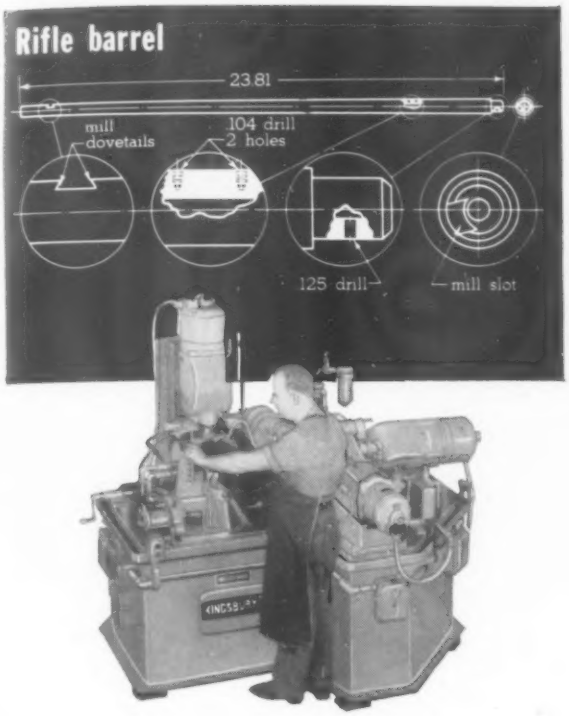
We Can Design, Build and Tool Your Machine

Ask our Mr. L. A. Carll for a proposal, and then compare your savings. Send him a print of a high production part and tell him the operations and hourly production you need. Or ask him for free bulletins that show 40 other setups. Kingsbury Machine Tool Corp., 50 Laurel St., Keene, N. H.

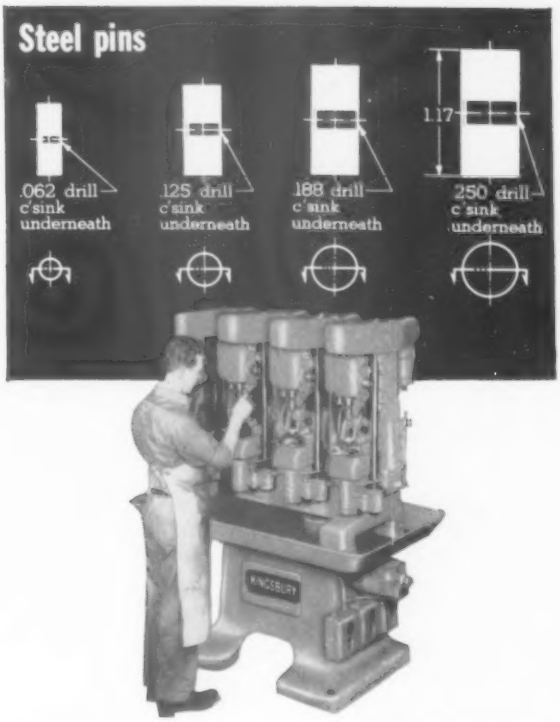
80

KINGSBURY

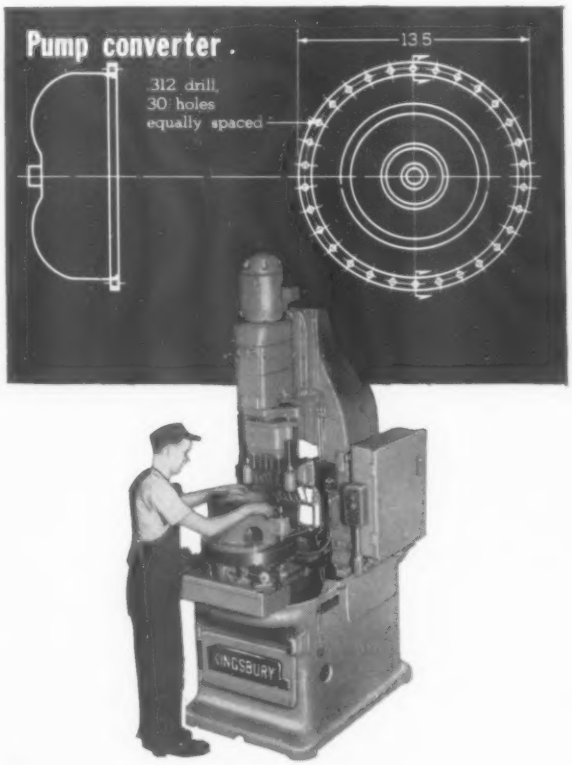
Solving High Production Problems



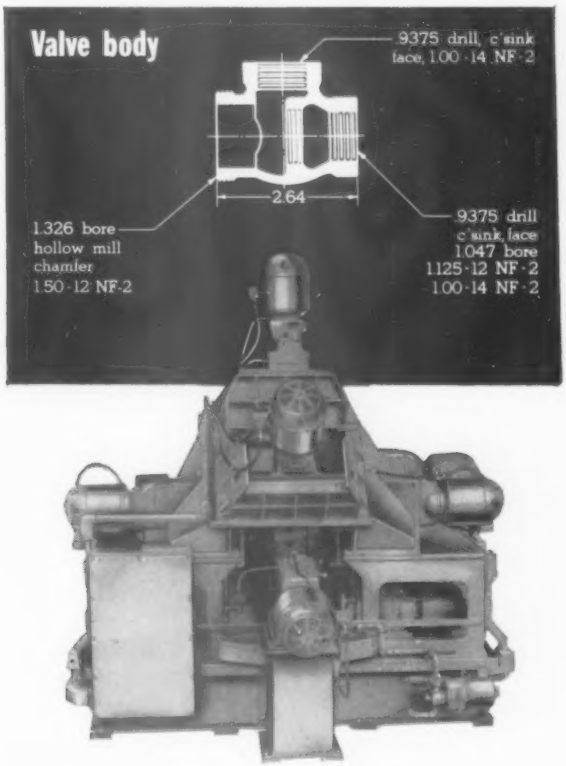
A MULTI-WAY NON-INDEX MACHINE has 4 units that mill and drill from 4 directions in 32 seconds. An air cylinder moves clamps that grip the part against vees with no distortion.



A CROSS DRILL AND COUNTERSINK MACHINE has 4 vertical drilling units and underneath burring attachments that complete 1100 pins an hour. The fixtures hold pins of different sizes.



AN INDEXING FIXTURE rotates each part on its own axis 60° each index. The drilling unit has a 5-spindle auxiliary head. Bushings guide the drills. Rate is 100 parts an hour.



A VERTICAL INDEXING MACHINE enables 4 horizontal units to work on each end of the valve. The rear view shows the 3 radial units for the outlet face. Rate is 500 parts an hour.

PRECISION FINISHED

in 23 seconds

Fellows "Full-Tool" Shaving More Than Doubles Output . . . Prolongs Tool Life

Shaving as a finishing process can now play an important role in low-cost mass production. The Fellows "Full-Tool" method permits a shorter stroke, provides freer cutting and higher reciprocating speeds and consequent greater output. Cutting action is so distributed as to obtain an even finer tooth finish with less wear on the shaving tool.

Every production-minded manufacturer will want to know more about this new method of low cost gear finishing. For more complete information contact our nearest office.

GEAR SPECIFICATIONS

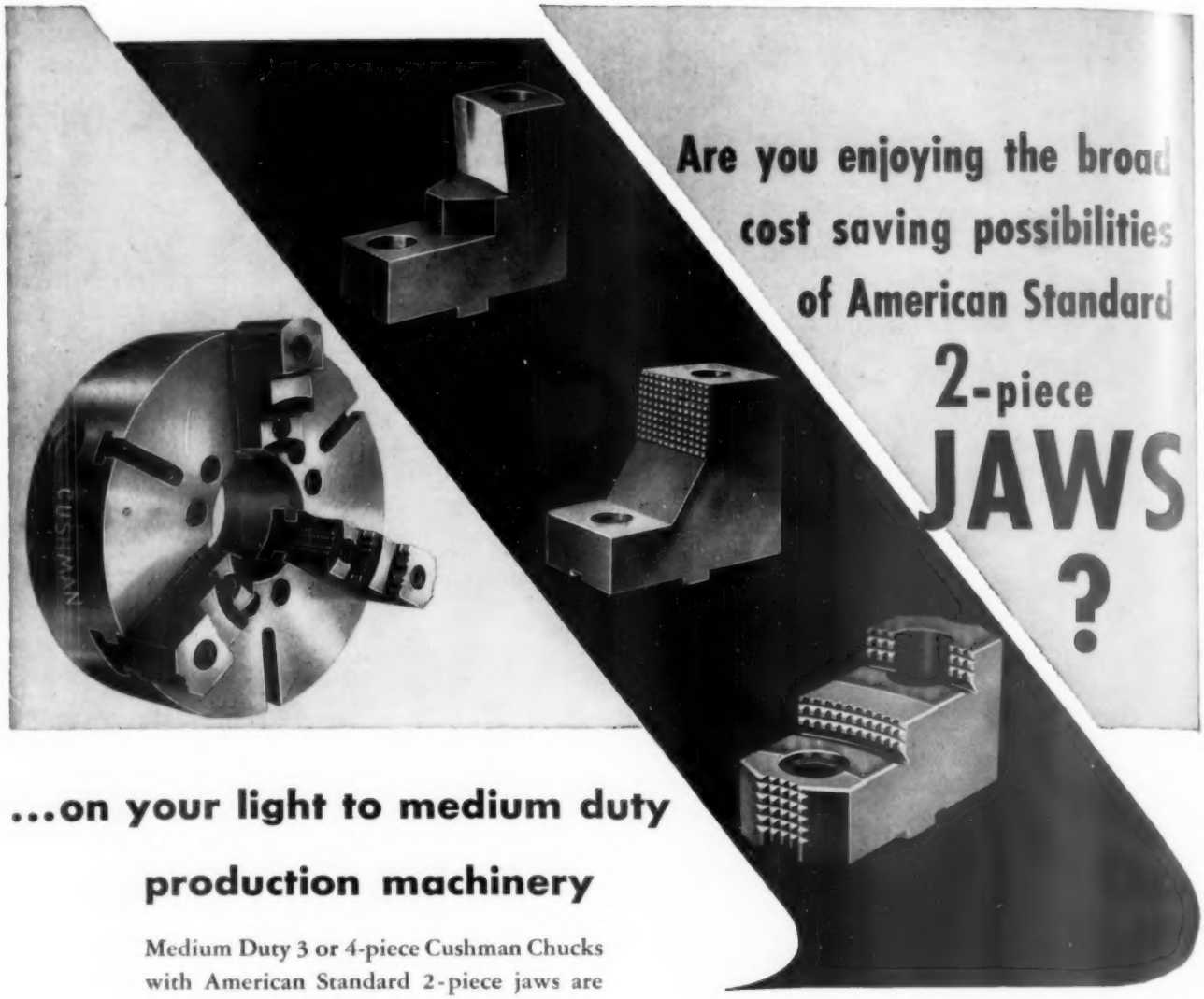
Material (Steel Forging)	S.A.E. 1024
No. of teeth	23
Normal pitch	10
Normal pressure angle	14°
Helix angle	42° 36′ 30″
Face width	1″
Lead limit	.0002″
Involute limit	= .0004″

Fellows

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2; 640 West Town Office Bldg., Chicago 12; 7706 Empire State Bldg., New York 1.

GEAR SHAPERS · THREAD GENERATORS · CUTTERS · SHAVING AND BURNISHING MACHINES
GEAR MEASURING AND INSPECTION INSTRUMENTS · PLASTICS MOLDING MACHINES



...on your light to medium duty production machinery

Medium Duty 3 or 4-piece Cushman Chucks with American Standard 2-piece jaws are the ideal equipment for your tool room lathes, your general purpose lathes and the great majority of lathes in your production departments. Because, with this type of jaw, you remount the top jaws when changing from one form of work piece to another... rather than using expensive work holding fixtures.

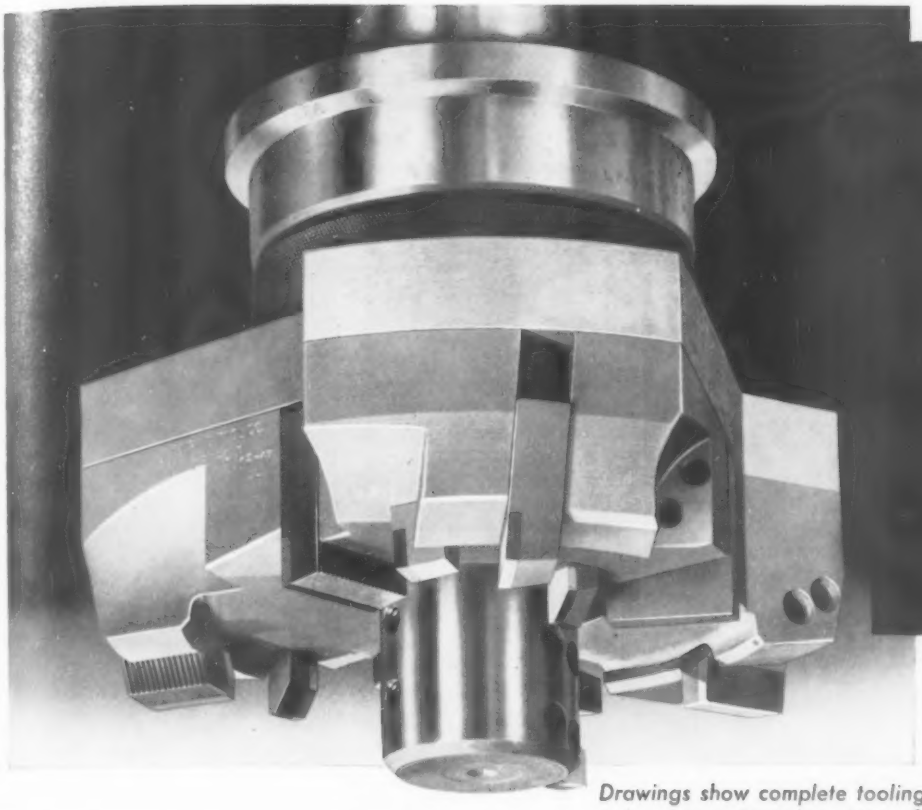
With this type of jaw equipment you can make full use of soft blank top jaws. These can be formed to hold all kinds of irregular shaped work pieces. And the cost will be far less than for special face plates or fixtures. With Cushman high standards of precision in chuck manufacture you can depend upon the accuracy of these set-ups for your most exacting work.

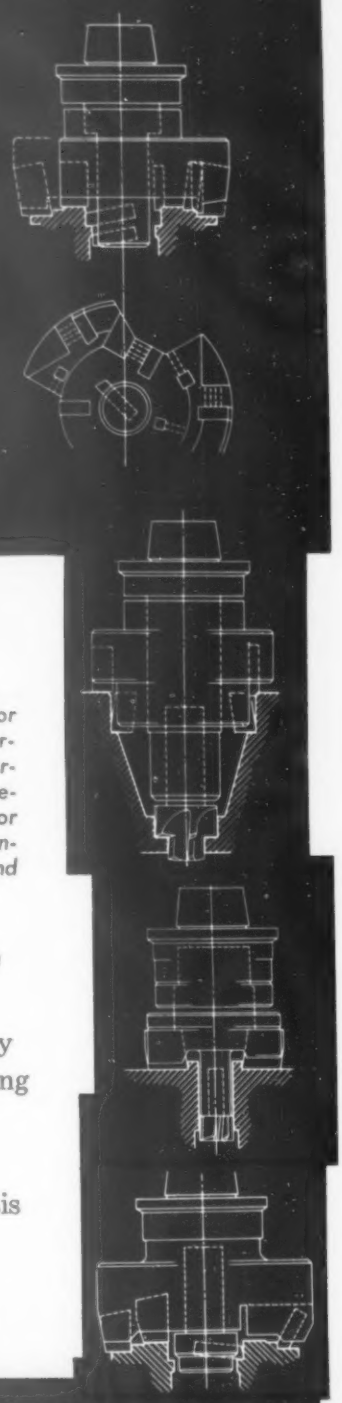
Our Engineering Department will be glad to give you further information and help on your own particular problems. Write us, without obligation.

THE CUSHMAN CHUCK CO.
Hartford 2, Conn.

Comprehensive Series of
CUSHMAN POWER CHUCKS
and
AIR CYLINDERS
are now available.
Write for Catalog PO63 and Bulletins

Consult
CUSHMAN
Chucking Engineers Since 1862





Drawings show complete tooling for a two-way, trunnion-type, four-spindle, roughing and precision boring machine, producing power take-off units. Each tool performs one or more operations such as boring, counterboring, chamfering, facing, and hollow milling.

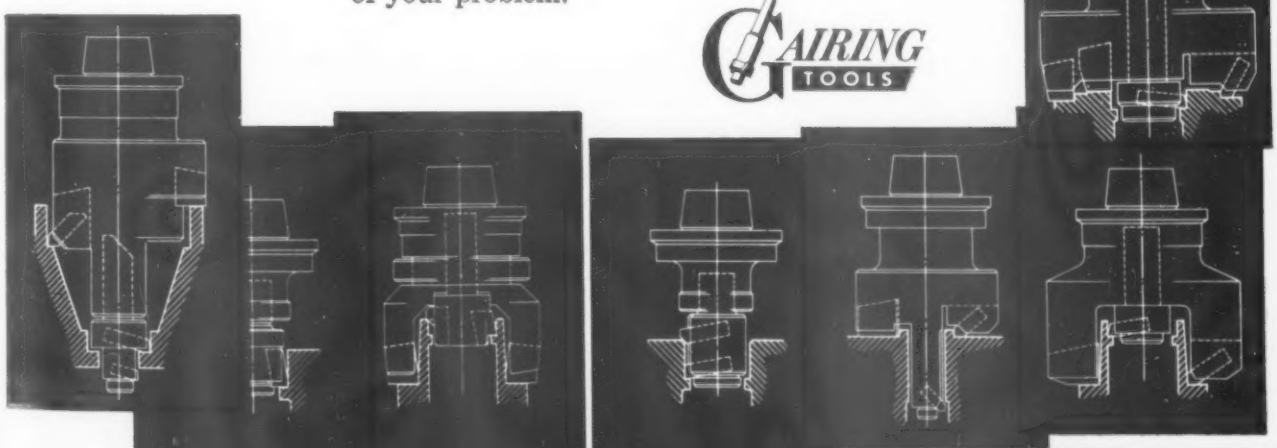
Multiple Tooling

More precision parts at lower costs are made possible through specially designed inserted blade cutting tools.

This actual example of multiple tooling recently completed by GAIRING suggests how the use of sound and proven principles of cutting tool design might improve the production of *your* machines.

So, if your present production falls short of expectations, let GAIRING'S engineers make a comprehensive analysis of your problem.

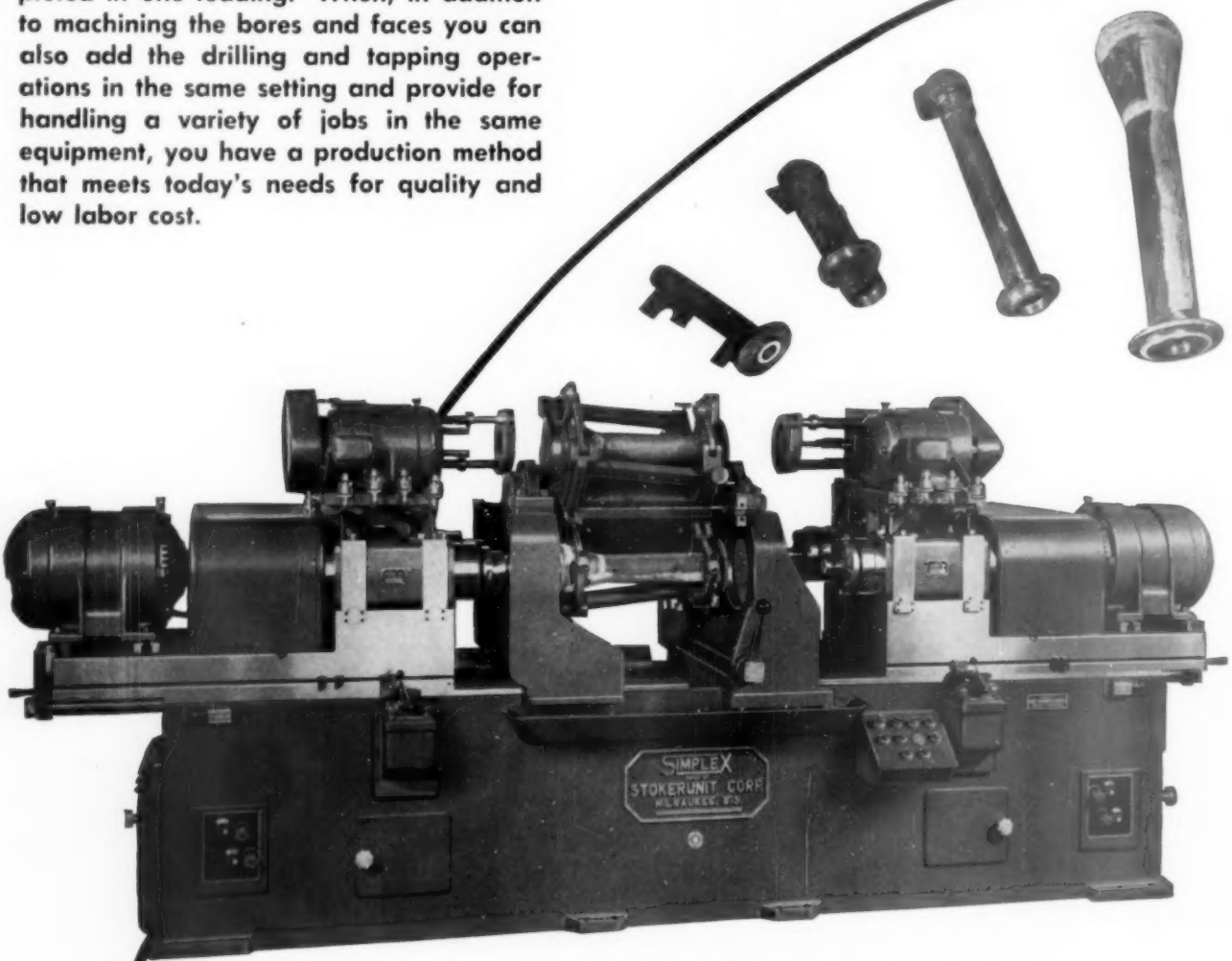
GAIRING TOOLS



THE GAIRING TOOL COMPANY · DETROIT 32, MICHIGAN

SIMPLEX

Machining tubular parts where the bores must be concentric, the faces parallel, is a difficult job unless the work can be completed in one loading. When, in addition to machining the bores and faces you can also add the drilling and tapping operations in the same setting and provide for handling a variety of jobs in the same equipment, you have a production method that meets today's needs for quality and low labor cost.



The machine pictured is a SIMPLEX 4U 2-way Precision Boring Machine with four #4 spindles mounting combination boring and facing heads and also carrying unit type drilling heads with bushing plates for the drilling operation. By changing the fixtures, drills and boring tools, the various pieces illustrated can be handled with the same machine, thus this machine becomes in effect a production department in itself.

Precision Boring Machines

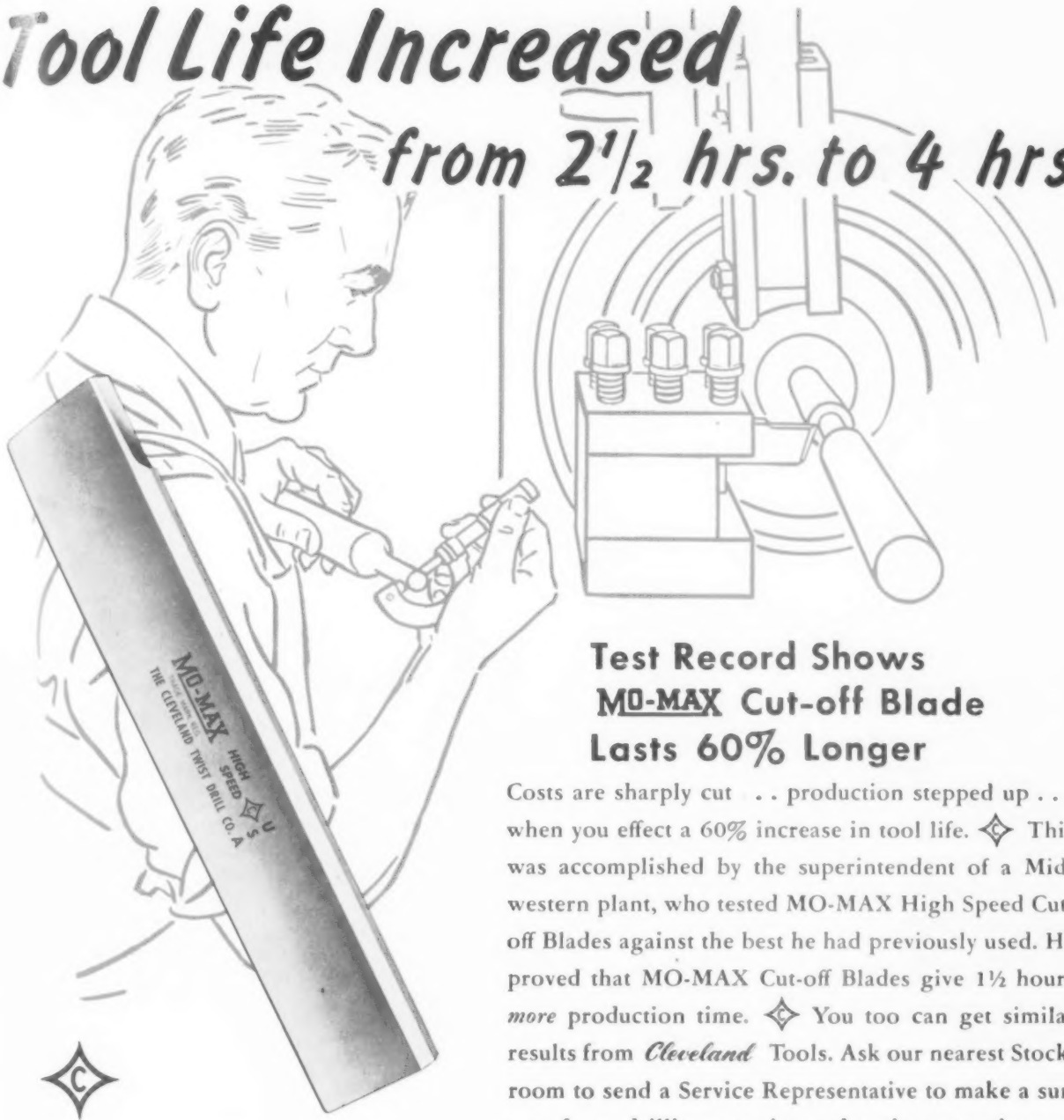
STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

Tool Life Increased from 2½ hrs. to 4 hrs.



Test Record Shows MO-MAX Cut-off Blade Lasts 60% Longer

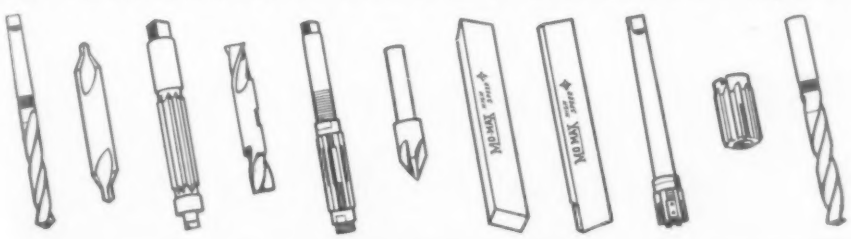
Costs are sharply cut . . production stepped up . . . when you effect a 60% increase in tool life. This was accomplished by the superintendent of a Mid-western plant, who tested MO-MAX High Speed Cut-off Blades against the best he had previously used. He proved that MO-MAX Cut-off Blades give 1½ hours *more* production time. You too can get similar results from *Cleveland* Tools. Ask our nearest Stock-room to send a Service Representative to make a sur-vey of your drilling, reaming and cutting operations, or

Telephone Your Industrial Supply Distributor

CLEVELAND

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5
Los Angeles 11 • London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER CLEVELAND TOOLS



SUPREME ACHIEVEMENT IN HIGH SPEED STEELS

VASCO SUPREME

U.S. PATENT NO. 2174285

a new cutting material

Performance results show tool life of Vasco Supreme exceeds that of tools made from ordinary High Speed Steels up to five times or more in the machining of plastics, brass, malleable and cast iron, cast and heat treated steels. These results are being obtained from all types of tools including turning and boring tools, milling cutters, hobs, broaches, drills, taps and reamers.

In addition to better tool life the properties of Vasco Supreme make possible increased speeds of 15 to 100% in many instances.

For cost cutting performance let us demonstrate the qualities of this new and revolutionary tool material!

Manufacturers of
First Quality
TOOL and DIE STEELS
—exclusively

Vanadium-Alloys
STEEL COMPANY
COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.
LATROBE, PENNSYLVANIA

First Fully AUTOMATIC LOADER For Gear Shaving Machines

● The Red Ring Automatic Loader, the first practical unit of its kind to be developed, has greatly increased the economy of the gear shaving operation. Equipped with such loaders, a battery of shaving machines can be kept in continuous operation by one man whose only duty is to keep their magazines loaded with work gears. That requires no skill.

Loading, clamping, shaving, unclamping, unloading and the final discharge of the finished gear are all automatic and fully protected by a safety mechanism. This is another significant accomplishment by the Red Ring organization which is today the world's largest manufacturer of gear shaving equipment.

The gear shown in the illustration here is an overdrive transmission planet pinion having 12 teeth, 13.5 D.P., 20° P.A., 1″ P.D. and a 1″ face. Actual shaving time is 11 seconds, loading and unloading 2.3 seconds or a total of 13.3 seconds for the complete cycle. This gives a production of 270 parts per hour. Stock removal is .005″ over pins.

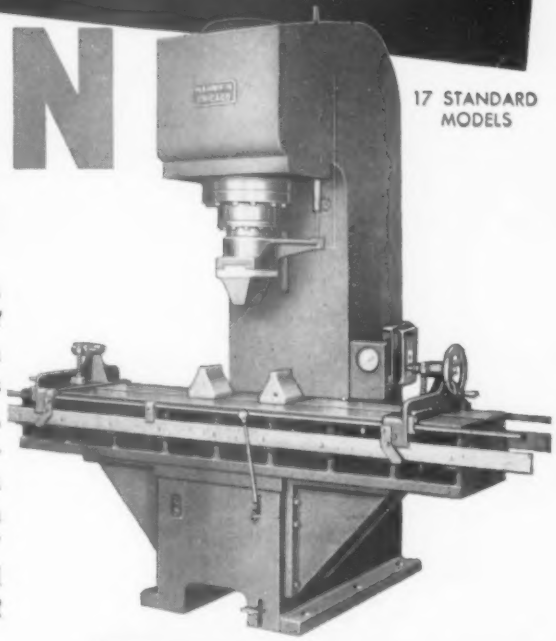
The Automatic Loader is applicable to Red Ring Shaving Machines GCV and GCU for automotive transmission gears or similar units. For further details and quotation, call a Red Ring Engineer.

"World's Largest Producer of Gear Shaving Equipment"

NATIONAL BROACH AND MACHINE CO.
5600 ST. JEAN • • • • • • • DETROIT 13, MICHIGAN

Standardized HANNIFIN HYDRAULIC PRESSES

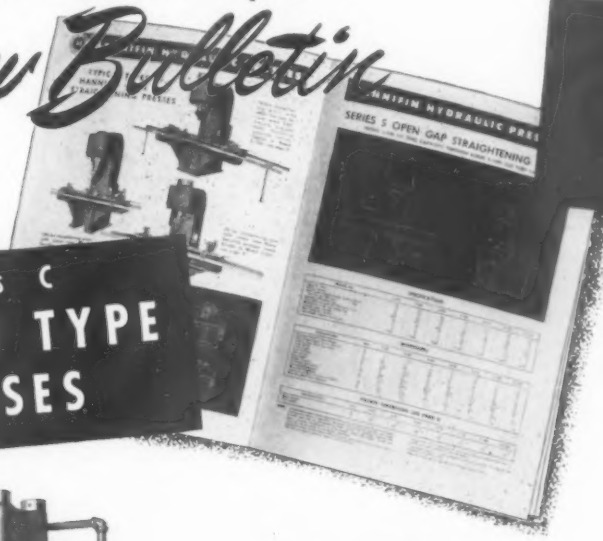
SERIES S
STRAIGHTENING PRESSES



17 STANDARD MODELS

HERE'S help for production men who want presses in a hurry! Hannifin now offers a complete *standardized* line of open gap and column type hydraulic presses in a full range of capacities from 6 to 150 tons. Out of this line, it's easy to select the press you need for forcing, straightening, forming, assembling, broaching, and similar operations requiring fast, accurate production with exceptionally smooth application of pressure. Hannifin gives you everything you want—modern *"JOB-TESTED"* designs . . . precision-built working parts . . . advanced control features . . . every operating convenience! Engineering recommendations on request.

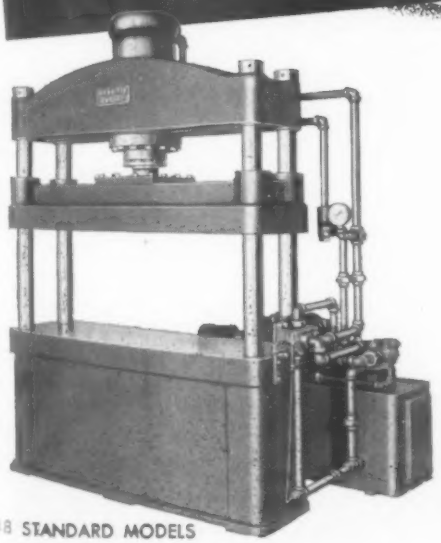
New Bulletin



SERIES F
FORCING PRESSES

10 STANDARD MODELS

SERIES C
COLUMN TYPE PRESSES



48 STANDARD MODELS

Lists 75 different standard models

● Get your copy of this new catalog! It contains detailed information on the design and construction of Hannifin's Standardized Hydraulic Presses together with specifications and dimensions for 75 different standard model presses. Ask for Bulletin No. 130-J

HANNIFIN CORPORATION

1101 S. Kilbourn Ave. HANNIFIN Chicago 24, Illinois

AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

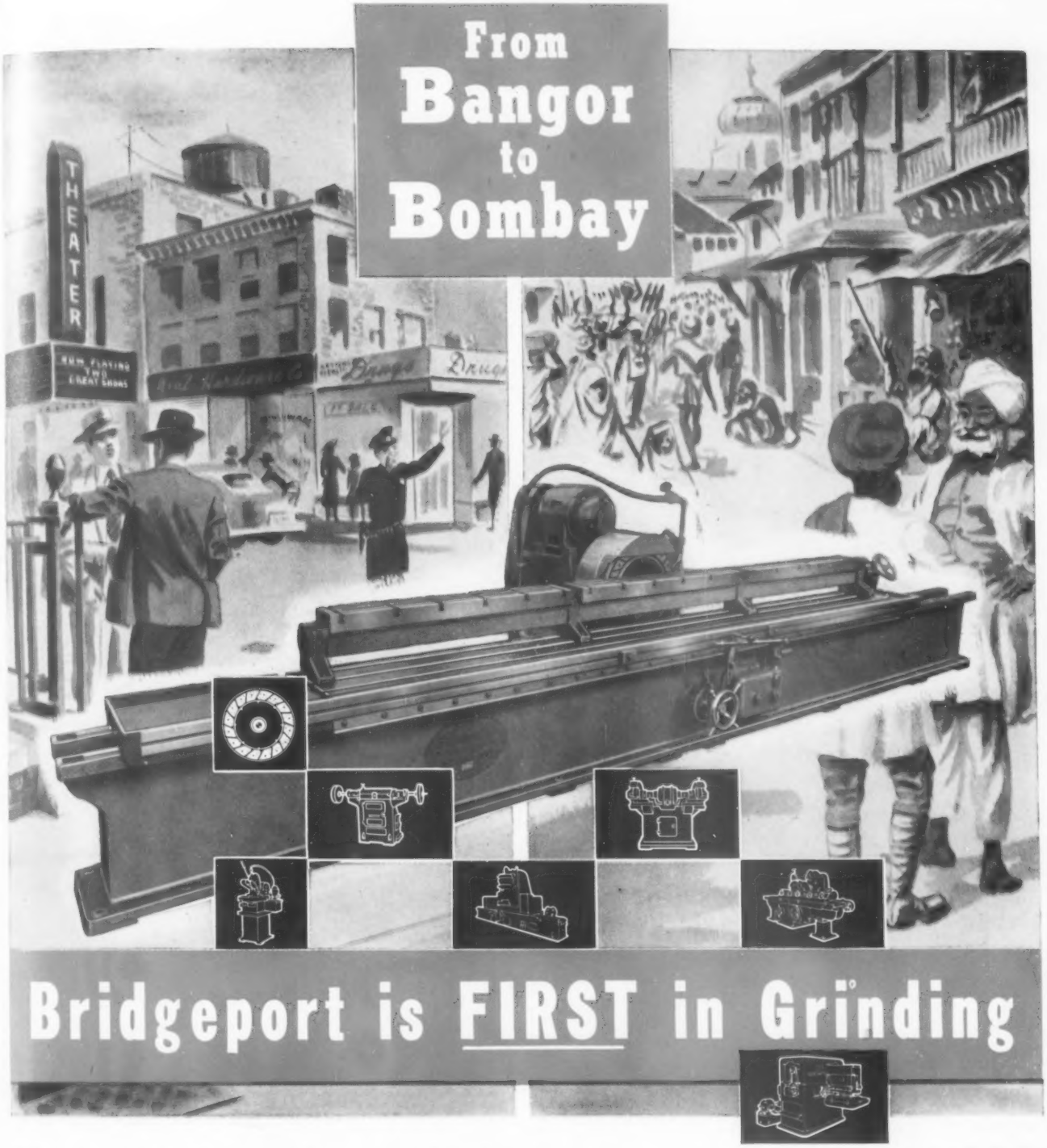
Nationwide Sales and Service

For accurate drilling, tapping, and reaming use UNIVERSAL DRILL BUSHINGS

Your production drilling, reaming, and tapping work goes ahead *smoothly and efficiently* when you put Universal Drill Bushings on the job. These are the precision manufactured bushings with super-honed bores that have been *the first choice of industry* since the founder of Universal Engineering Co. originated standard drill bushings nearly 30 years ago.

You get *more accurate work*—you *greatly reduce costly tool breakage* when you use Universal Drill Bushings . . . available in standard and special types and sizes. For prompt delivery, and for information on any tools in the complete Universal line, address your orders and inquiries to the Universal warehouse nearest you—89 Main St., Ansonia, Conn., or 5629 Sixth St., Kenosha, Wisc.—or write direct to our home office.

UNIVERSAL ENGINEERING COMPANY • **FRANKENMUTH, MICHIGAN**



Wherever there's grinding, buffing or cut-off work to be done, Bridgeport machines mean more profitable production. In many parts of the world there are Bridgeports as rugged after a quarter-century or more service as the day they were made. Today's models are built to give the same brand of service . . . and are engineered for far greater efficiency in applications as new as day after tomorrow.

To help you get the right wheel as well as the right machine for your work, *complete* engineering service . . . from abrasive specialists as well as equipment experts . . . is available from Bridgeport. And it's yours not merely for the guarantee period of a machine but for as long as you can use it to good advantage. For "johnny on the spot" help with any grinding problem, ask Bridgeport First.

Just off the press . . . New descriptive Bulletin 2700 on Hydraulic Face Grinders. Write for it.

Bridgeport

GRINDERS

Horizontal Face Grinders, Vertical Grinders, Cutlery Grinders, Buffing Lathes, Knife Grinders, Floor Grinders, Abrasive Cut-off Machines, BuXite Abrasive Wheels.

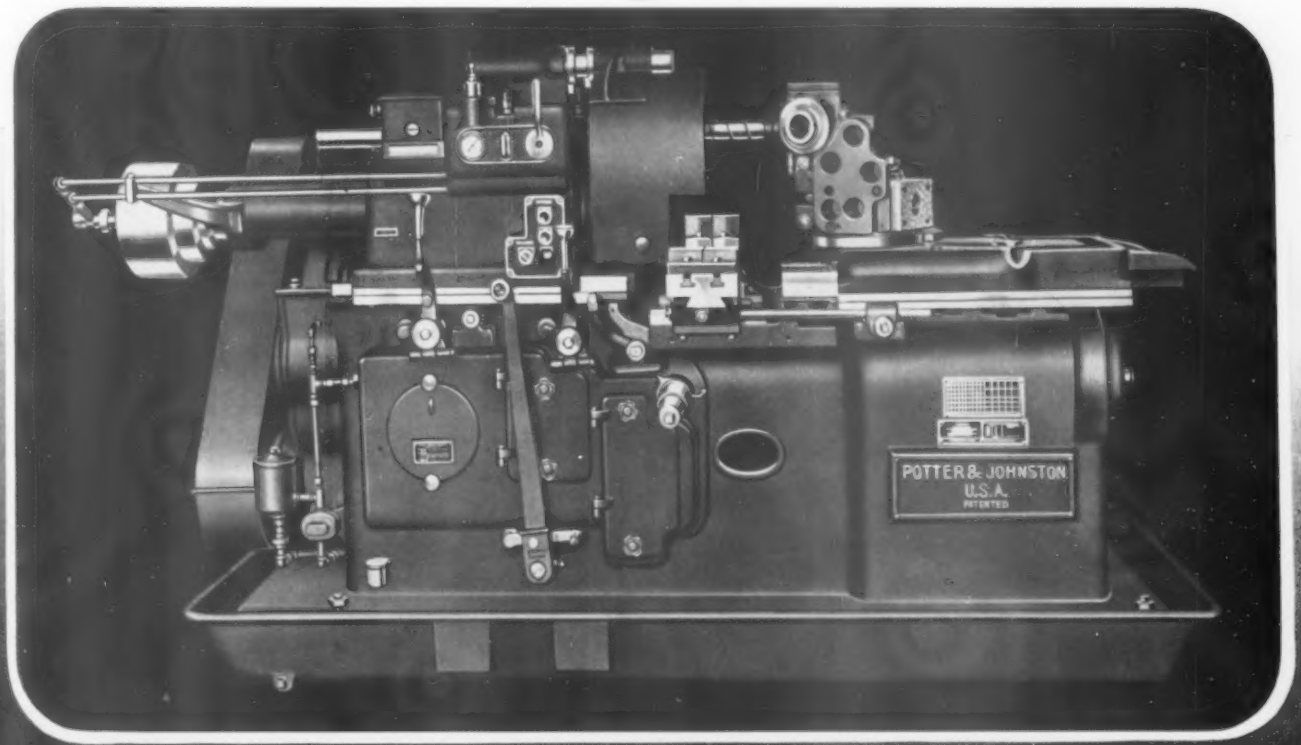
BRIDGEPORT SAFETY EMERY WHEEL CO.
1300 West Broad Street, Stratford, Conn.

A WELTERWEIGHT THAT PERFORMS LIKE A HEAVYWEIGHT . . . . . P. & J.'S

4D

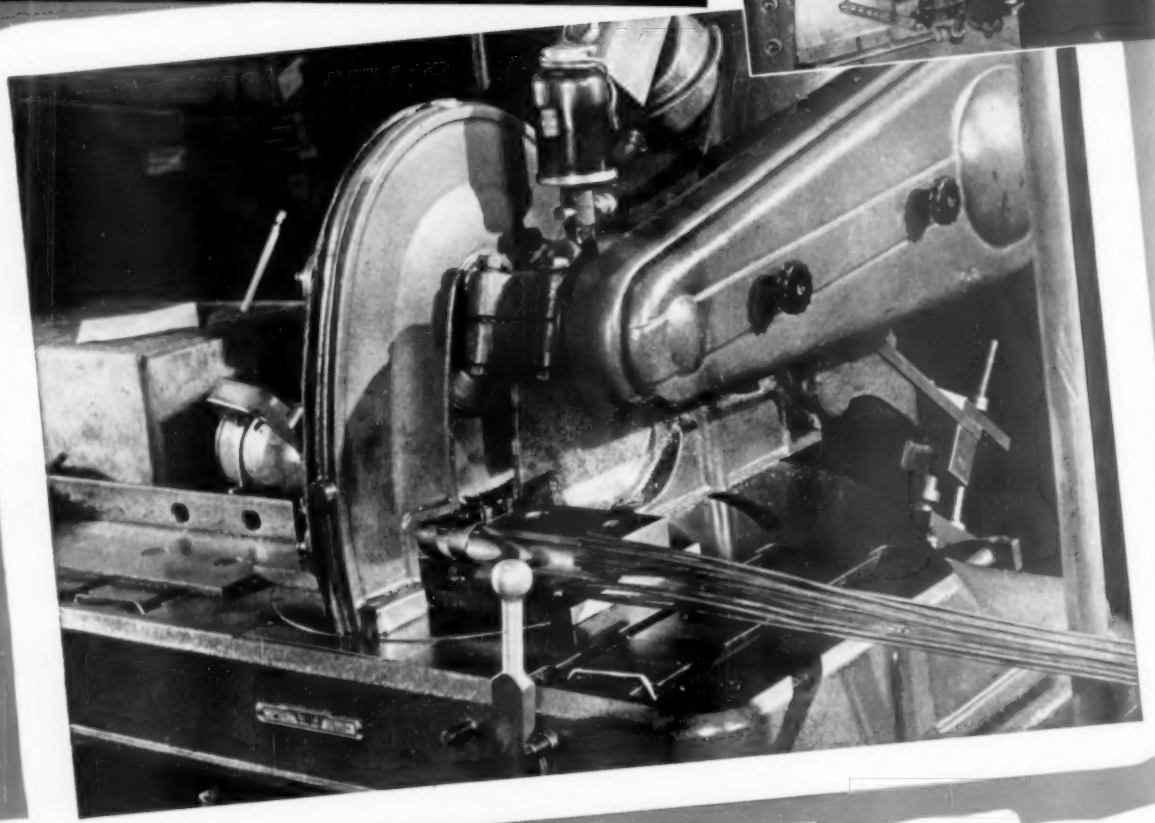
AUTOMATIC TURRET LATHE

This machine is designed to finish heavier castings and forgings, yet it produces the work as rapidly and as efficiently as the smaller and lighter automatic turret lathes. The Potter & Johnston 4D automatic turret lathe is so constructed that alignment remains permanent. Moreover, it has a remarkably long life. Check a few of these features: they will suggest some of the reasons why the 4D consistently pays its own way. BASE UNIT: of exceptionally heavy box section with hardened and ground steel ways of liberal dimensions. HEADSTOCK UNIT: adjustable so that minimum distance between spindle nose and the several turret faces may be varied 8½". SPINDLE SPEED: 15 changes of speed between 26 and 370 rpm., arranged in 5 sets of 3 automatic changes. Special semi-high and high speed models are available with spindle speeds of 35 to 492 rpm. and 69 to 696 rpm. respectively. FEEDS: 3 automatic variations of feed: coarse, medium and fine. CROSS SLIDE: swing over, 9¾" dia.; travel each way, 3¼"; turret travel 9½" to revolve. Cross slide and base are of new design, and entire mechanism is fully enclosed and operates in oil bath. TURRET FACES: 5 are provided for the mounting of tools. POWER: 7½ h.p. motor required to drive. NET WEIGHT: 8150 lbs. Boxed for sea shipment: 9000 lbs. Detailed description and specifications furnished on request.



POTTER & JOHNSTON CO.
PAWTUCKET, RHODE ISLAND
Subsidiary of
PRATT & WHITNEY
Division Niles—Bement—Pond Company

Inexpensive Air Motors* Double Output of Standard Cut-off Saw



From 4000 Pieces to 8000 Pieces per day is production record of this cut-off saw made automatic by Bellows "Controlled-Air-Power"

MILWAUKEE GAS SPECIALTIES COMPANY not only doubled production when they converted their hand operated cut-off saw to a semi-automatic machine, but they made a physically tiring job easy. Tool life was lengthened . . . quality of cut improved.

You, too, can convert your cut-off saw to an automatic unit quickly, and at low cost: A Bellows Air Motor to feed the saw, a Bellows Hydro-Check to provide utmost smoothness of feed, a second Bellows Air Motor to clamp the work.

Converting a cut-off saw to automatic operation is but one of many ways you can use Bellows "Controlled-Air-Power" to obtain faster production at lower cost. Any hand operated machine tool, such as drill presses, milling machines, grinders, etc., can be made automatic with Bellows equipment, quickly, and inexpensively.

We'll be happy to send you without cost

the newest Foto-Facts File Series which shows by photographs and case history what alert production men are accomplishing with "Controlled-Air-Power."

* The Air Cylinder with the *built-in* valve.

917

The Bellows Co.

Akron 9, Ohio

Only 4 HOLDERS FOR 25 CORE DRILL CUTTERS!

Standard stock two-piece core drill cutters from 1½" to 3" diameter.

For use in turret lathes or other applications where guide bushings are not required. Eliminates excessive overhang. Increases rigidity . . . Short body provides uniformity of length with other tools in turret . . . Maximum chip space because holder body diameter is same or less than root diameter of core drill cutter.

ECLIPSE COUNTERBORE CO.

Founded thirty five years ago

DETROIT 20, MICHIGAN

THESE *Extra* CONTROL FEATURES

at No Extra Cost . . . IN OILGEAR BROACHING MACHINES

Ever since Oilgear pioneered fluid power broaching many years ago, Oilgear has constantly sought to anticipate new needs in the broaching art . . . in order that this versatile tool might be made progressively better and more productive. Today, Oilgear Broaching Machines incorporate, as *STANDARD*, many features not furnished in other machines or only available at extra cost.

FEATURES OF OILGEAR ELECTRO-HYDRAULIC CONTROLS

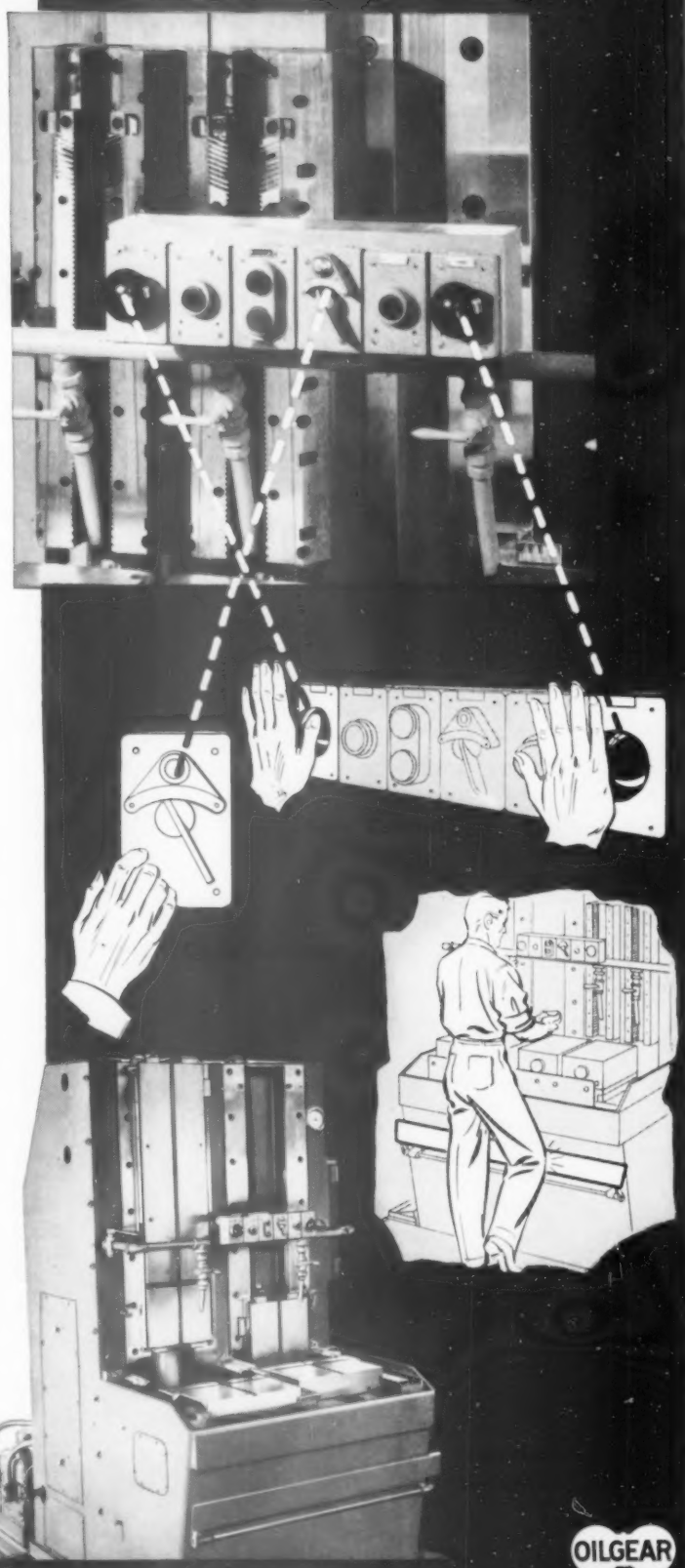
(The product of Oilgear's superior design and engineering)

CYCLE SELECTOR. Manual push-button, semi-automatic or full-automatic operation is selected quickly with ease through a nearby switch. There are no pilot and sequence valves and load and fire mechanisms to reset or cause trouble. Selector switch can be locked to prevent tampering by operator and damage to tools and fixtures.

SAFE CONTROL. Dual push-buttons protect operator against accidental starting of machine. Safe starting of broaching cycles is simple. There are no control levers, links, springs and valves to require overtravel, tire the operator and reduce production. Response to controls is instantaneous and positive; there's no needless, time-taking overtravel of tool.

EMERGENCY STOP. Operator can stop machine instantly at any point in cycle with emergency push-button or knee bar. There's no bending or balancing on one foot to depress a pedal or struggle to shift a lever. It's another factor of safety for operator and machine.

PROTECTED SWITCHES. Limit switches are mounted inside machine; protected from cutting fluid, chips, shop dust and other causes of damage. Relays are concealed in control panel on side of frame for easy inspection.



These are only a few of the many exclusive features of Oilgear Fluid Power Variable Speed Broaching Machines. Write for complete descriptive bulletins. THE OILGEAR COMPANY, 1308 W. Bruce Street, Milwaukee 4, Wisconsin.

OILGEAR

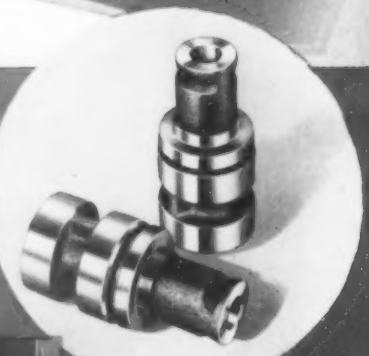
Oilgear Fluid Power

Index of Tool Engineer Advertisers

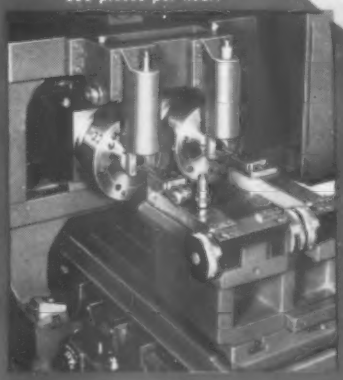
July, 1948

EX-CELL-O CAN GIVE YOU MORE ECONOMICAL PRODUCTION

Above: Full view of Ex-Cell-O Style 2112-A Precision Boring Machine arranged for automatic rough and finish boring of valve guide bushings. Parts enter chutes at left end of spindles, are fed through hollow spindle shafts to chucks, are rough and finish bored and ejected, all automatically, at the rate of *300 pieces per hour.*



Above: Automotive valve guide bushings with 11/32" holes, 2-3/16" long that are rough and finish bored on the machine shown above left.



Left: Close-up view of spindles and boring bar supports. Vertical castings in front of chucks house locating plungers that, when lowered, limit the forward travel of the bushings. Locators are withdrawn during boring and ejecting portions of cycle. Graduated dials on boring bar supports permit accurate adjustment of boring bar to control size of hole.

THIS ENTIRELY AUTOMATIC PRECISION BORING MACHINE IS TYPICAL OF EX-CELL-O SUPERIORITY IN ENGINEERING

● Here's a machine that receives automotive valve guide bushings from a conveyor line, rough and finish bores them and delivers them to another conveyor, all automatically. The bushings, 2-3/16" long with 11/32" bores, enter chutes at the left end of the spindles, are fed through the hollow spindle shafts to the chucks, are located, clamped, rough and finish bored and ejected at the rate of *300 pieces per hour.* Bores are held to a tolerance of .001". The operator need never touch the parts except to inspect the bores occasionally.

The engineering know-how that makes possible an automatic machine such as this one is always available to Ex-Cell-O customers, whether their work requires parts in short runs or great volume. Whether tolerances are measured in thousandths or ten-thousandths, Ex-Cell-O engineers will suggest the most practical and efficient method of finishing your parts. Call Ex-Cell-O today!

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

48—36

XLO
EX-CELL-O for PRECISION

Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Boring, Turning, and Facing Machines and Fixtures • Precision Cylinder Boring Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Precision Broach Sharpening Machines • Other Special Purpose Machines • Tool Grinders • Continental Cutting Tools • Broaches and Broach Fixtures • Counterbore Sets • Grinding Spindles • Hydraulic Power Units • Drill Jig Bushings • R.R. Pins and Bushings • Fuel Injection Equipment • Dairy Equipment • Aircraft and Miscellaneous Production Parts

Thousands of 'em!

Thousands of Precisionaire standard semi-finished gaging plugs are carried in stock for quick delivery.

Shipments made within one week from receipt of complete information—24 to 48 hours in emergencies.

This world's largest stock of "immediately available" air gage tooling protects Precisionaire users against production holdups or shutdowns.

Sheffield's interest does not diminish with the purchase of a Precisionaire. The instrument must be kept constantly useful. Quick tooling service from this great stock assures you uninterrupted performance throughout the long life of the instrument.

It is wise and thrifty to specify Sheffield.

5009

Sheffield's principal products include Gages, Measuring Instruments, Machine Tools, Threading Tools and Contract Services. Standard Gages shipped within 24 hours.

the Sheffield corporation

DAYTON 1, OHIO, U. S. A.

MASTER CRAFTSMEN SHEFFIELD HEADQUARTERS

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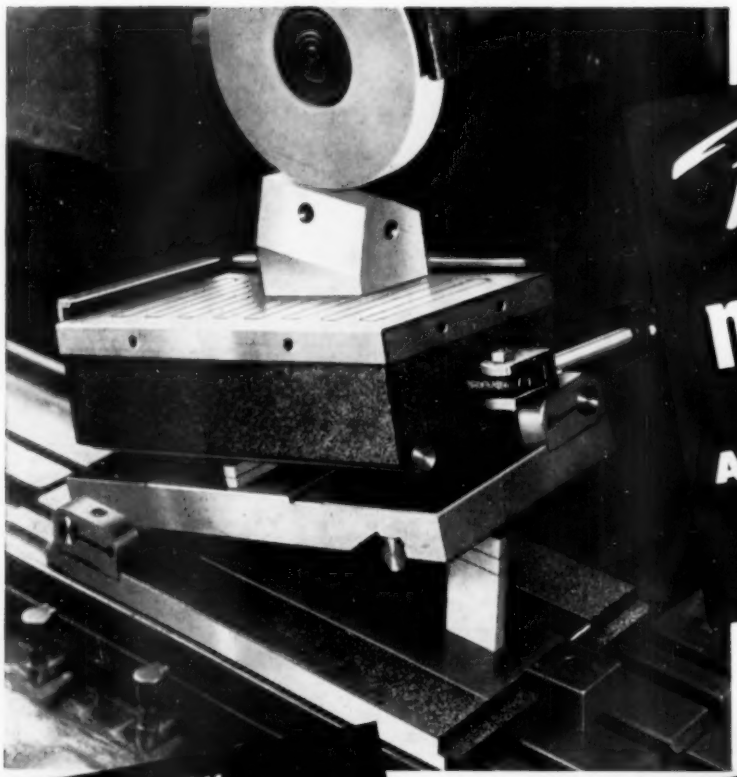


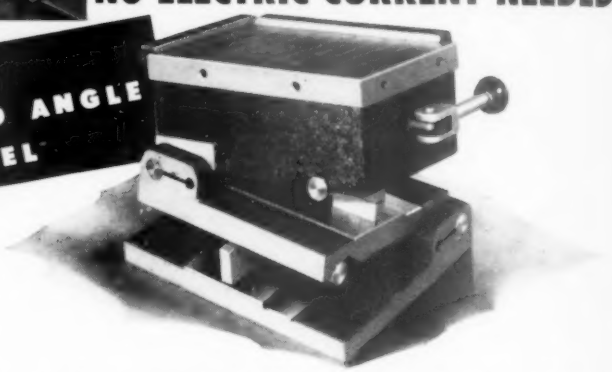
Permanent Magnet MAGNA-SINE *for* ACCURATE ANGULAR SET-UPS

Anywhere in your shop!

NO ELECTRIC CURRENT NEEDED*

10" COMPOUND ANGLE MODEL

5" COMPOUND ANGLE MODEL



The addition of a permanent-magnet chuck makes the Magna-Sine practical for use in any location throughout your shop . . . the magnetic holding power is always ready at the turn of a handle *without electric current.*

For grinding, boring, inspection and many other operations, the Magna-Sine has proven the only *fast* means of making precision angular set-ups. Set up by the sine bar method with standard gauge blocks, the Magna-Sine assures positive accuracy on both single and compound angles. When Magna-Sines are used for both machining and inspection of angular work, the possibility of error due to difference in set-up methods is eliminated.

Thousands of Magna-Sines are in daily use. Now the Permanent-Magnet Chuck provides the same accuracy—new versatility. Write for complete details. ***Robbins Engineering Company, 318 Midland Avenue, Detroit 3, Michigan.***

* *Magna-Sines are available in models for only single angles and models for both single and compound angles. Both models available in two sizes. Magna-Sines can be furnished with electric magnet chucks when specified.*

Robbins
ENGINEERING COMPANY

Producers of ROBBINS MAGNA-SINE • ROBBINS UNIV-ANGLE
ROBBINS SINE PLATE • ROBBINS INDEX TABLES
ROBBINS No. 3 DRILLMATIC • SPECIAL MACHINERY